Evaluation of a staff-led clinical redesign program to improve patient flow through outpatient clinics: a mixed methods study

by

Lisa Ann Stanton B.Pharm (Hons)

School of Medicine

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“A journey of a thousand miles begins with a single step”

Lao Tzu

This thesis is dedicated to my mum

Declaration of originality

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Oral presentations

Stanton, L, Peterson, G, Stankovich, J, Ford, K, & Quarmby, C. '*Clinical redesign in Ophthalmology and Plastic Surgery outpatient clinics at the RHH'* 27 July 2018 Paediatric Clinical Meeting, Royal Hobart Hospital, Tasmania

Stanton, L, '*Are all wait lists created equal*' 27 November 2017, HSI Research Meeting, Hobart Tasmania.

Stanton, L, Peterson, G, Stankovich, J, Ford, K, & Quarmby, C '*Does the application of clinical redesign improve patient flow in Plastic Surgery RHH Outpatient clinic?*' 14 August 2017, HSI Research Meeting, Hobart, Tasmania.

Stanton, L. *'A mixed methods PhD: an epistemological disaster?'* 10 April 2017, HSI Research Meeting, Hobart, Tasmania.

Stanton, L. '*Does clinical redesign improve patient flow in outpatient clinics?*' 4 December 2015, Confirmation Seminar, School of Medicine, University of Tasmania.

Poster presentations

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List of Abbreviations

ABS	Australian Bureau of Statistics
ACT	Australian Capital Territory
AIHW	Australian Institute of Health and Welfare
CEO	Chief Executive Officer
CMC	Carpometacarpal
DNA	Did Not Attend
DOB	Date of Birth
Dr	Doctor
ED	Emergency Department
ENT	Ear, Nose and Throat
FTA	Failure to Attend
FTE	Full-time Equivalent
FUPS	Flawed-Uncertain-Proximate-Sparse
GP	General Practitioner
GPLO	General Practitioner Liaison Officer
HSI	Health Services Innovation
HPC	Health Partners Consortium
HR	Human Resources
iPM	i Patient Manager
IT	Information Technology
KPI	Key Performance Indicator
K-wire	Kirschner wire
METeOR	Metadata Online Registry
MRC	Medical Research Council (United Kingdom)
NHS	National Health Service (United Kingdom)
NT	Northern Territory
NUM	Nurse Unit Manager
OA	Osteoarthritis
OECD	Organisation for Economic Co-operation and Development
OFM	Oral and Maxillofacial
PASID	Patient Assigned Identification
PDCA	Plan-Do-Check-Act
PDSA	Plan-Do-Study-Act
PROMS	Patient Reported Outcome Measures
QI	Quality Improvement
RHH	Royal Hobart Hospital
RMO	Resident Medical Officer
RTT	Referral-To-Treatment
SMS	Short Message Service
TA	Thematic Analysis
THAP	Tasmanian Health Assistance Package
THO	Tasmanian Health Organisation
THS	Tasmanian Health Service
TPS	Toyota Production System
UK	United Kingdom
US	United States of America

Abstract

Introduction

An increased demand for health services in Australia is driven by an ageing population, increased consumer expectations, expensive technologies and a growing burden of chronic diseases. The complexity of the health system presents challenges for patients with chronic health conditions as they may be under the care of multiple health professionals across primary and secondary settings. As primary care practitioners serve as the 'gateway' to the secondary care, a referral is required to enter this wider health system. In publicly funded hospitals, secondary care is usually provided by outpatient clinics and is triaged based on clinical urgency. This results in the patient being placed on a wait list.

Waiting times for outpatient care in Australia are not subject to the same level of scrutiny as elective surgery waiting times, time spent in emergency departments or inpatient length of stay. The only nationally collected metrics are the number of 'service events' (appointments), the types of services provided, demographic information of the users and how the services are funded. This study is important as it highlights the problems of analysing data from an area of health which places minimal value on collecting and maintaining accurate statistics and places a focus on an under-researched area of health.

The aim of this research was to evaluate a staff-led clinical redesign program where an external body (the University of Tasmania) worked in collaboration with the health system. This project was part of a federally funded state-wide program to improve the effectiveness, efficiency and long-term sustainability of Tasmania's health system. Outpatient clinics were one of five key areas targeted for redesign in Tasmania's public hospitals. From internal hospital data, outpatient clinics that had a long wait time to first appointment, a high Did Not Attend (DNA) rate, a low discharge rate and a high number of hospital and patient-initiated cancellations were invited to participate.

Lean methodology has shown success in redesigning healthcare processes which involve a linear sequence. Patient flow is the successive movement of people through a sequence of processes along a pathway of care. In this study, patient flow encompassed all the steps between referral into the outpatient clinic, obtaining an appointment and transfer back to community care and is referred to as a 'value stream.'

This mixed methods study had an embedded research design where the secondary data set (in this case, the qualitative data) was embedded in the primary data set (quantitative) and used to answer the following primary research question:

> *Does the application of clinical redesign improve patient flow through Plastic Surgery and Ophthalmology Outpatient clinics?*
>
> *Patient flow was defined by the following measures:*

- Percentage of patients who waited longer than the clinically recommended time before attending their first outpatient appointment by triage category
- Median wait time to the first appointment by triage category
- Did Not Attend (DNA) rate
- Discharge rate
- Hospital and patient appointment cancellation rates
- The number of overdue follow-up appointments

Method

This was a mixed methods observational study in which a staff-led clinical redesign program was evaluated. The intervention began with staff from all working areas of two outpatient clinics being instructed on the Lean practices of standard work processes and the reduction of waste during a 2-day workshop. The aim of the workshop was for staff to map the current value stream to identify areas of waste and inefficiency and agree on a 15-month redesign strategy (with the help of a redesign consultant and a project officer).

The purpose of this research was to assess if the staff-led redesign program improved patient flow parameters by comparing the pre-study and intervention metrics. A unique feature of the study was that the hospital only provided raw appointment and waitlist data for analyses. This was a deciding factor on the choice of an embedded research design. The qualitative data (patient and staff surveys, field notes and redesign meeting notes) facilitated the construction of a visual model of patient flow, which fully informed the choice of patient flow metrics for the quantitative analysis. The qualitative data was also used to confirm the internal validity of the quantitative results. As a measure of patient flow, the primary objective was to assess the change in the proportion of patients who waited longer than the clinically recommended time limit for their respective triage categories (category 1 <30 days, category 2 <90 days and category 3 <365 days) for a first appointment.

Another feature of an embedded design is that the secondary data set can be used to answer a separate research question. In this research the qualitative data from both clinics were combined into one data set and thematically analysed to answer the secondary research question:

What are the factors influencing the implementation and success of the redesign initiatives?

Results

Clinic demand and patient access were the main foci of the redesign activities for the Plastic Surgery Working Group. A new model of staff flow during clinic sessions was introduced, along with a nurse-led clinic dedicated to complicated dressing changes. A 'Physio first' model of wrist care was trialled but failed to see any patients. New staff guidelines were written to enforce current practices with an emphasis on safely discharging patients back to community care.

The percentage of category 1 patients who waited more than 30 days for their first appointment decreased during the study, from 43.5% to 28.6% ($p < 0.00001$). This mainly reflected a decrease in the number of long-waiters, as the median wait time only changed slightly (from 8 to 6 days). Although the percentage of category 2 patients waiting longer than 90 days remained high (97.4% vs 96.4%),

the median wait time decreased significantly (560 to 405 days, p<0.0001). The median wait time for category 3 patients did not show a significant change (1112 to 1038 days, p=0.3).

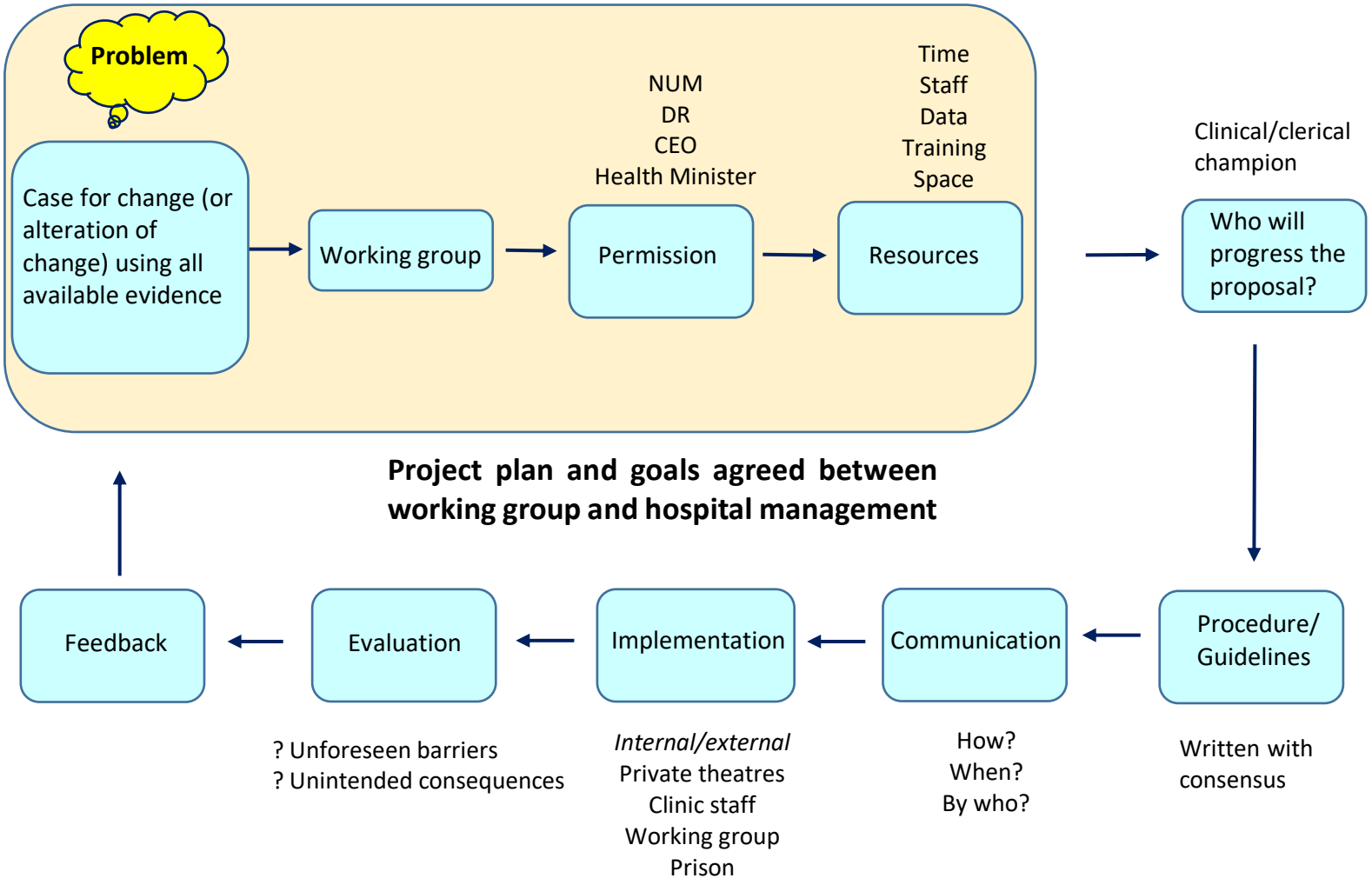
The other measures of patient flow were DNA rate, discharge rate and appointment cancellations. The overall clinic DNA rate did not change significantly (13.7% vs 12.7%, p=0.06). When the data was examined for targeted interventions, there was a decrease in the DNA rate of return appointments in the registrar hand clinic (15.6% vs 13.1%, p=0.02), with the biggest improvement in the registrar hand clinic on Tuesday afternoons (17.0% vs 11.8%. p=0.00005). There was a modest improvement in the discharge rate for return appointments (24.7% vs 26.6 %, p=0.001), which may have been higher if the data set was complete. The hospital and patient cancellation rates could not be calculated with any accuracy because of the multiple methods of processing cancelled appointments by the hospital.

Clinic demand and patient access were also the main foci of the Ophthalmology Outpatient clinic redesign activities. Diabetic retinopathy screening referrals were no longer accepted, a practice consistent with larger Australian eye hospitals. A systematic discharge program was implemented for all current diabetic retinopathy patients with mild or no disease, back to community optometrists/ophthalmologists. Due to an incomplete data set the change in the discharge rate during the study could not be accurately calculated (although this initiative alone was known to discharge at least 285 patients). The number of overdue follow-up appointments as an outcome measure was not part of the initial study plan, as it was not a recognised element of patient flow through the clinic system. It was the Ophthalmology Working Group who recognised patient flow as the delicate balance between allocating appointments to patients from the wait list, post-operative appointments and patients who were due follow-up appointments. During the Intervention period, as the number of patients on the outpatient wait list decreased, the number of patients overdue for their follow-up appointment increased. The cause was multifactorial, as there were an additional 102 surgeries during the Intervention period and each of these patients required at least one follow-up

appointment, as well as the concentrated effort to allocate appointments to category 2 patients from the outpatient wait list.

Data integrity provided challenges throughout the analysis, especially when interpreting the Ophthalmology Outpatient clinic results. The business rules for how appointments were made and cancelled were not established prior to the project, which resulted in an incomplete data set and the method of triaging of the referrals to the clinic changed three time during the Pre-study period. Despite this, the largest change in the waiting time to first appointment which could be attributed to the redesign program was for category 2 patients (median wait time decreased from 183 to 123 days, $p<0.0001$).

Three overarching themes were identified as factors influencing the implementation and success of the redesign initiatives in both clinics: Context, People and Process. Context described how the local characteristics of the project impacted the study (e.g. physical space, funding arrangements and available data). The People theme included human capital and how local engagement and understanding influenced the outcome of the program. The final theme – Process – was the largest and most diverse of all the themes, as nearly all the initiatives were affected by a process issue. To emphasise the importance of timing and sequence of steps in the redesign project, a process map was developed as an extension of the thematic analysis findings. This was an expanded version of the conventional 'plan-do-study-act' cycle, often used in health care redesign programs. The cycle highlighted the importance of considering and completing each step before progressing to the next.


Problem
Case for change (or alteration of change) using all available evidence
Working group
NUM
DR
CEO
Health Minister
Permission
Time
Staff
Data
Training
Space
Resources
Clinical/clerical champion
Who will progress the proposal?
Project plan and goals agreed between working group and hospital management
Procedure/ Guidelines
Written with consensus
Communication
How?
When?
By who?
Implementation
Internal/external
Private theatres
Clinic staff
Working group
Prison
Evaluation
? Unforeseen barriers
? Unintended consequences
Feedback

Discussion

A range of factors were identified that influenced the implementation and success of the clinical redesign program for the outpatient clinics. One of the main facilitators identified was the team approach to problem solving. The solutions were identified by the working groups, which gave them a sense of personal ownership of the change process. The working group from each clinic consisted of multidisciplinary front-line staff, with two internally recruited staff members employed full-time on the project. Other facilitators included adaptation to local content, staff acknowledgement of the need for change, training, and additional resources in the form of time and money when required. Physician engagement was present throughout the study for the Ophthalmology group but was inconsistent for the Plastic Surgery group and by the end of the study this working group did not have a medical representative.

There were different barriers for the implementation and for success of the redesign initiatives. Scope creep was an issue for one of the working groups and subsequently not all the ideas were implemented. Managerial support for the redesign activities also varied. Even when the redesign initiatives were implemented, success was not guaranteed. Ideas were not systematically tested once implemented, and communication between the working group and the clinic staff was hampered by most staff working part-time in their respective clinics. Timing was a problem when management implemented some initiatives prior to finalising the details with the working groups.

Bigger system issues regarding inconsistent appointment and cancellation data entry by the administration staff meant that some of the metrics were unable to be measured accurately or were under-reported. As this project was funded externally, there were time pressures to commence and complete the project, but staff employment was performed internally by the hospital. This resulted in an accelerated time frame for clinic recruitment and medical staff engagement for the project.

Limitations

Additional staff members were employed (unrelated to the study) which may have increased the capacity of one of the clinics. Data integrity was a continual problem throughout the analysis because the raw appointment and wait list data had not been previously examined to this level of detail. Due to the complex nature of patients moving through the clinic system, there may have been extraneous factors which were unidentified.

Conclusion

Healthcare systems are renowned as complex adaptive systems which are highly resistant to change. When change does occur, it is slow and is generally achieved by regular locally-driven improvements which are substantiated by reliable data. The application of clinical redesign did lead to some improvements in patient flow in the Plastic Surgery and Ophthalmology Outpatient clinics, but the limited availability of reliable performance data hampered the assessment of several outcome measures. This research highlighted the importance of timing and defining the scope and goals for an externally-funded health system improvement program. One of the main recommendations was that ample time is incorporated in the planning stage of large-scale multi-organisational programs to ensure background issues are comprehensively studied prior to the intervention phase. This allows for contextual factors to be incorporated successfully into the project plan.

1 Introduction

My initial interest in the outpatient clinic clinical redesign program was as a result of my employment as a care coordinator in 2014. It was my job to assist clients living in the community to navigate the health system and obtain the care they required. Many clients asked me to explain (and de-code) the correspondence they received from healthcare providers. It is important to share the stories behind the statistics and headlines to highlight that small changes in the accessibility of healthcare services can make a large difference to patients and their families. The following true story was not an uncommon scenario for elderly clients living alone:

Beth, an 87-year-old ex-army nurse, had collated her outpatient appointment letters for me to add to her diary. She received four letters (for four appointments) in three different clinics in the coming months. She wanted me to cancel one of two eye clinic appointments, because although they were documented on separate letters, they were scheduled only 15 minutes apart on the same day. If it wasn't too much trouble, could I also enquire what the orthopaedic appointment was for, as no further problems were encountered after successful knee replacement surgery 5 years ago. Whilst I was on the phone to the hospital, could I also make a podiatry appointment as the custom-made orthotic shoes were 'too heavy'. In addition, would it be possible for all the appointment times to be changed to 10 am or later. Mary who normally accompanies Beth to her appointments, drives to Beth's house where they are taken by taxi to the hospital. Mary, who is also elderly, refuses to drive in the city and also doesn't like driving locally until after the school drop-off period each morning.

This scenario highlighted the additional difficulties faced by clients with complex care needs living in the community with limited transport options and how decreasing the number of unnecessary appointments could improve the quality of life for these people.

1.1 Research context

All the above headlines were taken from Tasmanian newspapers between 2014-2016. One of the articles discussed the high number of public outpatient appointment cancellations, and the other four of the articles reported on the long waiting time between obtaining a referral from a general practitioner (GP) to the initial appointment at Tasmanian public outpatient clinics. This has been referred to as the "hidden waitlist" because this waiting time is not nationally measured in a consistent manner.[1] The quality of publicly available data on hospital outpatient clinics vary from state to state, making comparisons challenging. International statistics of outpatient waiting times are not comprehensive either, as there are considerable differences in the referral processes between countries.[2] The outpatient clinics at the Royal Hobart Hospital were chosen as part of a larger healthcare redesign program to investigate the causes of the long waiting times and to improve access to specialist outpatient services for the people of Tasmania.

1.2 Tasmania

Tasmania is Australia's smallest and only island state, with a population of 519,063.[3] The median age of Tasmanians is the oldest of all Australians at 42 years, whilst the median Australian is aged 38 years. Tasmania has the second lowest life expectancy of all the states of 82.8 years (national average of 84.5 years). Tasmania has the greatest level of socioeconomic disadvantage in Australia with a median weekly household income of $1100 ($1734 nationally) in 2016.[4] Tasmanian's experience the highest rates of arthritis, asthma, heart disease, hypertension, kidney disease and obesity in Australia in 2016.[5]

The Tasmanian Health Service (THS) is divided into three service regions – South, North and North West. The south of the state has the largest population, with a catchment area of 260,000 people.[3] The Royal Hobart Hospital (RHH) is the largest hospital in the state with approximately 500 beds. As the only principal referral hospital, the RHH offers some specialised services not available elsewhere in the state (e.g. neurosurgery, neonatal intensive care). Some specialties have clinicians based in Hobart who travel regularly to host clinics in the northern hospitals e.g. genetics, infectious diseases. The North (catchment population 144,000)[6] and North West (catchment population 113,000)[6] each have one public hospital with a 24-hour emergency department, an intensive care and some specialist units, but do not contain the same breadth of units as the principal referral hospital. The North West is also serviced by a smaller hospital with limited specialised facilities.

All four public hospitals offer outpatient services, triage their own referrals and manage their own clinic wait lists. Using the THS Outpatient clinic website, referrers (e.g. GPs) are able to view the medical conditions which are managed in each of the three regions and the corresponding referral criteria.[7] Referrals are faxed directly to the relevant clinic in each hospital.

1.3 University of Tasmania

The University of Tasmania was appointed by the Commonwealth Government to manage an initiative of the Tasmanian Health Assistance Package (THAP).[8] The Commonwealth committed $325

million in 2012 to THAP, with $12 million allocated to the University. The overall THAP funding consisted of 18 elements spread across government and non-government organisations to improve the effectiveness, efficiency and long-term sustainability of Tasmania's health and community system. Health Services Innovation (HSI) Tasmania (based at the University of Tasmania) was established to work with the Tasmanian Health Service to help implement a clinical redesign program from 2013 to 2016. The initial phase of the program was a diagnostic assessment of health service delivery in Tasmania's public hospital system. Data were collated and examined against the following criteria, to identify key priority areas.[9]

- Health service processes / pathways / functions that place the greatest pressure on the health system;
- Health service processes / pathways / functions that, through redesign, have the potential for the greatest gain to patient outcomes and health system efficiency (cost-effectiveness) and sustainability;
- Potential for State-wide applicability or learnings;
- Cognisance of, and potential synergy with, other initiatives underway or planned that address Tasmanian health system priorities.

A Health Partners Consortium (HPC), consisting of the following key stakeholders was appointed to operate as an advisory body to HSI, with one of the main tasks being to advise on appropriate areas for redesign. The consortium membership was comprised of the:

- Independent chair,
- Project sponsor, University of Tasmania,
- Representative nominated by the Tasmanian Minister for Health,
- Secretary, Department of Health and Human Services,
- CEO, Tasmanian Health Service,
- CEO, Primary Health Tasmania,
- Community representative,
- Clinical representative of the Tasmanian Health Service,
- Representative of the Commonwealth Department of Health,
- Co-Directors, Health Services Innovation Tasmania, and the
- CEOs of the three Tasmanian Health Service Regions (non-voting ex officio).

At the HPC meeting in June 2014, outpatient clinics were included as a key area for redesign. This decision was based on a HSI report (using RHH data) which found that patients were waiting longer

than the clinically recommended time to attend their first appointment, had a high number of appointment cancellations (both the hospital and patients), and a high number of Did Not Attend (DNA) appointments.

Outpatient clinics were one of five key areas targeted for the clinical redesign program. The other areas were – emergency access, elective surgery, bed demand (capacity and flow), and mental health. All regions of the state were involved in the redesign activities, with each region participating according to their requirements. A clinical redesign consultant (either external or in-house) supervised the redesign initiatives in each of the five key areas. In Hobart, a total of five full-time program officers (one for each program) and one research assistant were employed, and the outpatient clinic redesign program was granted an additional support officer to assist with wait list audits and other clerical activities.

1.4 Outpatient clinics in Tasmania

1.4.1 Ophthalmology

The RHH was the only hospital to provide a public ophthalmology outpatient service in Tasmania during the study period. Public patients living in the North and North West attended private clinics. At the time of this research, the THS South clinic was staffed by five part-time consultants (1.35 full time equivalents (FTE)), two registrar training positions, 0.5 FTE optometrists, 0.53 FTE orthoptists and approximately 2.5 FTE nurses. The clinic offered general ophthalmology services for adults and children, with specialist clinics for glaucoma, macular degeneration and cataracts. In addition, a low vision clinic staffed by optometrists provided assessments and strategies to help clients to live independently. The clinics functioned on a four-week rotating roster (all weekdays) with ophthalmologists and registrars performing operations in both the public and private hospital theatres. This arrangement was part of an agreement between the State and Commonwealth governments to reduce the elective surgery waiting times for cataract procedures for public patients.[10]

1.4.2 Plastic surgery

Both the THS South and North provided a public Plastic Surgery Outpatient clinic. The THS South clinics offered general plastic surgery, hand and wrist surgery, paediatric (including cleft palate) surgery and body contouring. Burns clinic patients were included in the Plastic Surgery caseload but were not included in this study as the Burns clinic was not situated in the same location as the other Plastic Surgery clinics. The caseload was approximately 150 admissions per month with 50% comprising of trauma cases. Each week, up to 189 appointments could be scheduled (39 *New* appointments, 134 *Review* appointments, and 16 *Emergency* appointments). Four consultants worked part-time with registrars, resident medical officers and intern medical staff sharing the case-load. All *New* appointments were allocated to a consultant, whilst *Review* appointments were assigned to either a consultant or registrar. The two large registrar clinics were rostered on Tuesday and Thursday afternoons (at the same time as the hand physiotherapy clinic in the adjacent room). This arrangement allowed patients to see a doctor and a physiotherapist in the same visit.

1.5 Study aim and questions

1.5.1 Study aim

The aim of this thesis was to investigate the impact of an external body working in collaboration with the health system to implement a staff-led clinical redesign program to improve patient access and flow in the Plastic Surgery and Ophthalmology Outpatient clinics, and to identify the facilitators and barriers of success.

1.5.2 Research questions

This study was a multiphase, emergent, mixed methods design. As per an embedded design[11], the primary research was an analysis of the dominant data set - the quantitative data. The data from each clinic were analysed separately to answer the following research question:

1. *Does the application of clinical redesign improve patient flow in Plastic surgery and Ophthalmology Outpatient clinics? Patient flow was defined by the following measures*:

- Percentage of patients who waited longer than the clinically recommended time before their first outpatient appointment by triage category
- Median wait time to the first appointment by triage category
- Did Not Attend (DNA) rate
- Discharge rate
- Hospital and patient appointment cancellation rates
- The number of overdue follow-up appointments

The qualitative data from both outpatient clinics were combined into one data set and thematically analysed to answer the secondary research question:

2. What are the factors influencing the implementation and success of the redesign initiatives?

1.6 Purpose statement

The purpose of this mixed methods study was to evaluate a staff-led, Lean-inspired program of clinical redesign in two outpatient clinics at the same tertiary referral hospital in Tasmania. This was a pilot project with the possibility of being extended into other areas of the RHH in the future. The study was an observational emergent design, divided into three interconnecting phases.

Phase one. This phase involved the researcher gaining an understanding of how patients moved from the community through the clinic system and subsequent discharge. Pre-study patient surveys were undertaken by the researcher (on behalf of the staff) with the aim of detecting areas in the patient journey which would benefit from change. From the five clinics who volunteered to take part in a 6-month program of clinical redesign, this phase was used to decide which and how many clinics to evaluate. This phase concluded with a 2-day Lean-inspired clinical redesign workshop. The goal of the workshop was for staff to identify areas of waste and inefficiency and agree on a redesign strategy.

Phase two. All the redesign initiatives took place during this phase (which was extended to 15 months). A comprehensive understanding of the redesign program was gained by the researcher through attendance at all the redesign meetings, as well as observations in the staff working area and patient waiting area. The qualitative data was collected in a diary format in combination with

annotated minutes of all the redesign meetings. Staff and patient surveys were undertaken as part of both quantitative and qualitative data sets.

Phase three. This was the evaluation phase in which patient flow parameters from the pre-study period were compared with the intervention period. A unique feature of this study was that the hospital only supplied the raw wait list and appointment data and did not perform any analyses. This was the main contributing factor for choosing an embedded research design. The qualitative data (surveys, field notes (diary) and redesign meeting notes) enabled the construction of a visual model of patient flow which guided the choice of the patient flow parameters used in the analysis. The purpose of choosing an embedded design was for the qualitative data to both support and validate the quantitative findings whilst also answering a separate research question.

The evaluation of patient flow was undertaken separately for each clinic. The qualitative data from both outpatient clinics were then combined into one data set to study the factors influencing the implementation and success of the redesign initiatives.

1.7 Thesis structure

Chapter two, Literature Review: This chapter explores the available literature on clinical redesign in the outpatient setting and is divided into two sections. The first describes the history and nature of healthcare redesign, concentrating on Lean methodology and its mixed evidence of success. The reasons behind the paucity of good quality studies concentrating on outpatient clinics are discussed, as many academic articles are case studies from a single site, often authored by the health professionals who performed the research. The second section illustrates the complexity of describing waiting times for an outpatient appointment and the explanation behind the limited publicly available data in Australia.

Chapter three, Methods: This chapter describes the rationale for choosing the multiphase, emergent mixed methods design. The research phases are clarified, and the data collection tools are presented. As this study is an embedded design, this chapter illustrates how the qualitative data (field notes,

surveys and researcher's diary) was amassed to create a diagrammatic representation of patient flow through each outpatient clinic. This then enabled the quantitative data (patient flow metrics) from each clinic to be analysed. The qualitative data is embedded in the quantitative analysis as the patient flow parameters from the pre-study period are compared to the intervention period to answer the primary research question. The second research question was answered by thematically analysing the combined qualitative data from both clinics.

As this is an observational study, the rationale for modifying the original research plan is explained in this chapter.

Chapter four, Results: Background information common to both Plastic Surgery and Ophthalmology Outpatient clinics: This chapter provides context for the quantitative results presented in Chapters 5 and 6. This background information is common to both clinics and this chapter explains how appointments are allocated, the composition of the clinical redesign work groups and how the results were presented to the work groups during the program.

Chapter five, Results: Plastic Surgery: This chapter contains the quantitative results with an embedded description of the major staff-led interventions under the headings of Problem, Solution and Analysis. The staff survey results are included as part of the analysis. A visual model of patient flow is presented and, starting with a description of the waitlist additions and removals, each of the five measures used to monitor patient flow are calculated. The qualitative data set is continually consulted to ensure that changes to patient flow could be attributed directly to the clinical redesign program.

Chapter six, Results: Ophthalmology: This chapter follows the same format as Chapter five, with the addition of the specific challenges encountered due decreased data integrity.

Chapter seven, Results: Thematic analysis: This chapter presents the three overarching themes identified when the combined qualitative data sets were thematically coded for facilitators and

barriers associated with the implementation of the redesign initiatives. A complete thematic map is presented which includes the sub-themes, codes and an example of each code.

Chapter eight, Discussion: A comparison is made between the clinic characteristics and the redesign project characteristics to explain the similarities and differences in the Results of the two clinics. The second section of the chapter discusses the importance of timing and order in the change management process. A redesign process map was then developed from the thematic map and each of the steps are explained in detail, reinforced by evidence from the literature. The study strengths and limitations are discussed along with recommendations for policy makers, managers, clinicians and future research.

1.8 Significance and contribution of the research

This research provides results and recommendations for policy makers, health service managers and staff undertaking change management initiatives. From the literature review it was found that outpatient clinics are an under-investigated area of research. This prospective mixed methods study was unique in that it examined the impact of an external body working in collaboration with the health system to implement a staff-led clinical redesign program. As the researcher conducted all the quantitative analyses from raw hospital data, this study was able to highlight the Australia-wide problem of poor data quality affecting outpatient clinic performance measures. The thematic analysis of the qualitative data resulted in a visual process map of clinical redesign, which further refined the sequential nature of change management. The findings further emphasised the importance of working with cohesive teams and the staff ownership of the change process, which was frequently at odds with timelines imposed by the external funding bodies. The recommendations for future multi-organisational clinical redesign programs include an extended planning phase with goals and timelines agreed to by all parties, and sufficient resources and staff incentives to participate. This acknowledges the burden placed on staff during periods of extended change.

1.9 Summary

The University of Tasmania was granted $12m from the Federal government as part of a state-wide health assistance package to improve the effectiveness and efficiency of the healthcare provided in Tasmania's four largest public hospitals. Outpatient clinics were one of five areas chosen to undergo a staff-led clinical redesign program, due to the long waiting time to attend the first appointment, high DNA rates, low discharge rates and high appointment cancellation rates. The aim of this thesis was to investigate the impact of the redesign program on patient flow parameters in two outpatient clinics at the RHH, and to identify the facilitators and barriers to redesign success.

2 Background and literature review

Chapter 1 briefly described the research setting and the background of HSI and clinical redesign in Tasmania. The literature review is divided into 2 distinct sections. Part 1 describes the history of healthcare redesign, concentrating on Lean methodology and the "Kaizen blitz", the chosen technique for educating and training hospital staff in this study. The mixed success of Lean interventions is discussed as well as the effects of Lean on the working conditions of the staff. Part 1 concludes with highlighting the paucity of high-quality redesign literature in the outpatient setting. Part 2 describes the limited reporting of outpatient wait times in Australia, and the problems encountered in trying to compare data when wait times are not measured and reported in a uniform manner.

2.1 Healthcare redesign.

In the 1997 report, *To err is human: Building a safer health system*, it was estimated that in 1997 there were at least 44,000 deaths a year in United States hospitals as the result of preventable medical errors. The authors concluded that the decentralised and fragmented nature of the healthcare delivery system was unsafe for patients and an impediment to efforts to improve safety. The goal of the report was to change the status quo and to create a culture which learnt from the analysis of errors.[(12)]

Around the same time, healthcare costs world-wide began to rise. Health expenditure in Australia over a 25-year period (1989-90 to 2013-14) grew faster than inflation, the population, and ageing of the population.[(13)] Taking into account inflation, the increased expenditure was from $50.3 billion in 1989-90 to $154.6 billion (2013-14) in real dollar terms. The per person expenditure increased by 123.5% and the ratio of total spending to the size of the population aged 65 years and over increased by 69%.[(13)] Many countries set up national healthcare improvement agencies (e.g. UK, US, the Netherlands, Australia) and used redesign methodologies to drastically change the way healthcare was being delivered. Ideas and techniques were frequently shared between the bodies.[(14)] In 2003, it was suggested that redesigning healthcare systems had become an international preoccupation.[(14)]

The analysis of these quality improvement initiatives showed mixed success. In the first major review of systematic reviews on the effect of interventions to improve quality of patient care, Grimshaw *et. al.* concluded "passive approaches are generally ineffective and unlikely to result in behaviour change. Most other interventions are effective under some circumstances..."[15]

As value-based metrics (e.g. patient outcomes) are being increasingly used to assess health services, the organisational approach to patient care is changing.[16] This is a change from the previous volume based metrics. The ideal triple aim is a better patient experience, better health outcomes and reduced healthcare costs.[16] To implement successful healthcare redesign a shared vision is required between managers who traditionally want increased organisational productivity and healthcare professionals who aim for increased service quality.

2.1.1 Quality improvement methodologies

Although there are numerous Quality Improvement (QI) methodologies in the literature they have been summarised by Walshe as having four basic common themes.[17]

1. Most employ the ideas of a cycle of improvements, with the following steps;
   i) data collection, problem description and diagnosis,
   ii) generation and selection of potential changes and,
   iii) implementation and evaluation of the changes.

2. A common set of QI tools are used during each stage of the improvement cycle.

3. There is acknowledgement of the organisation's capability for improvement, the need for supportive leadership (clinical and managerial) and clear organisational commitment to the aims of the project.

4. Importance of engagement of frontline staff and the need for improvement processes to be a part of the service delivery.

Several authors have suggested that the differences between the QI methodologies mainly relate to the emphasis placed on particular themes and ideas.[17, 18] Six sigma methodology from Motorola is a statistical technique based in the reduction of defects, whereas Lean from Toyota focusses on the elimination of waste. The combination of the two methods, Lean six sigma, relies on a team effort by staff to improve performance by reducing variation and removing waste. Business Process Re-

engineering holistically analyses workflows and business processes. Total Quality Management describes a management approach to long-term success where all members of an organisation participate in improvement. "These QI methodologies are more like dialect forms of a common language than they are like different languages. They share a common basic grammar and vocabulary and differ mainly in areas like pronunciation and accent". p.156 [17]

2.1.2 Lean principles

Lean principles are based on the Toyota Production System (TPS). With roots tracing back to Sakichi Toyoda's automatic weaving loom developed in 1924, the Toyota Motor Company has been continually striving to identify and eliminate waste, and establish efficiency in the entire organisation.[19, 20] Waste (*muda* in Japanese) refers to any human activity which consumes resources but creates no value. Any activity can be labelled waste if the end-user is not prepared to pay for it. This includes such activities as repeating work due to errors, staff being idle, excessive movement of people or equipment, and the production or ordering of stock that is currently not required. Central to Lean principles is the definition of value, and in healthcare, it is the patient who defines it. [21] The term "Lean" (when referring to the TPS principles) wasn't coined until 1988, by John Krafcik in his paper "Triumph of the Lean Production System".[19]

When redesigning a service or area, the first step according to Lean philosophy is deciding the scope of the project. This includes: where the process begin and ends, what is being made, and identifying your "customers" and what they value.[22] Healthcare organisations have borrowed the term "value stream", which originally applied to the steps involved in producing a product or service from raw materials. Value stream in health refers to the journey of a patient through a medical facility or the transfer of information that enables patients to move from one place to another.[23] To implement Lean techniques for redesign a five-step thought process is adopted.[19]

1. Specify value from the standpoint of the customer.
2. Identify all the steps in the value stream for each product family, eliminating those steps which do not create value.

3. Make the value-creating steps occur in tight sequence so the product will flow smoothly for the customer.
4. As flow is introduced, let customers pull value from the next activity.
5. As value is specified, value streams are identified, wasted steps are removed, and flow and pull are introduced. Begin the process again and continue it until a state of perfection is reached in which value is created with no waste.

As Lean is an organisational philosophy, it is the task of the Lean facilitator to embed Lean thinking and principles into the work practices of the staff. This can be achieved by a variety of measures, including workshops, newsletters and attendance at staff meetings.[22] The idea is to promote the value of continuous improvement and to avoid creating "pockets of excellence" which has been noted widely in the literature of Lean initiatives.[24, 25] When Lean thinking is implemented in healthcare, outcome measures are chosen with the view that the new model of working should both benefit and be important to the patients and the healthcare practitioners.[22]

2.1.3 A Kaizen project

The theme of continuous improvement lies at the core of Lean practice (Kai = change and Zen = good).[21] Masaaki Imai (the author of the frequently cited book *Kaizen*) describes Kaizen as "improvement or continuous improvement in social life, home life, personal life and working life. In the workplace, Kaizen means continuous improvement involving everyone - managers and workers alike."[26] The operational form of Kaizen is a technique of solving problems. It is proposing ideas of improvement incrementally and sustained over time. [27] The series of steps known as a Kaizen project was translated by Japanese executives from an earlier version originating in 1939 known as the Shewhart cycle.[26] The 1951 version (Plan-Do-Check-Act) denotes the four-step cycle for problem solving (Figure 2.1).[28] Sawanda renamed it as the well-known Plan-Do-Study-Act (PDSA) cycle in 1993.[27]

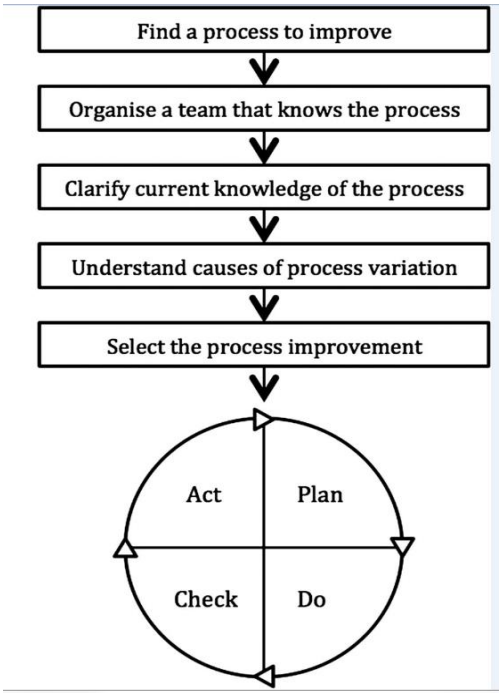


Figure 2.1 The Plan-Do-Check-Act cycle from 1951

Suarez-Barraza & Miguel-Davila (2014) discussed the strict requirements outlined in the book *The Toyota Way* by Liker and Meier to implement a Kaizen project PDCA improvement cycle.[27]

1. Defining the problem.
2. Completing a thorough root cause analysis.
3. Considering an alternate solution to the cause.
4. Applying a PDCA to implement the improvement project, and
5. Reflecting on the learning process.

The continual improvement culture of Kaizen at the *gemba* (workplace) is used to eliminate *muda* (waste) is the one central idea of the Toyota management system.[27]

All projects undertaken require a defined nature, scope and outcome, which are clear to all parties.[29] Central to Lean is the concept of value – for whom is the work done.[30] There are many customer groups in healthcare (patients, caregivers, decision makers, taxpayers) and assigning the incorrect customer can result in no group being satisfied with the changes.[30] This is especially important with Kaizen events as they usually involve some groups of people who may not normally see each other on a daily basis, but work on the same value stream. All key stakeholders in the value stream should be

represented fairly and participate in meaningful discussions.[29] This includes voices from other departments that are affected by the changes.[16]

2.1.4 A Kaizen blitz

A Kaizen event/blitz is a separate technique from a Kaizen project. Kaizen events last between three and eight days, and Kaizen improvement projects can last up to six months, at which point another one starts.[27] The notion of the blitz is that the workers identify opportunities for quick wins – changes that can be implemented immediately to improve processes. These are usually unnecessary waste activities.[19]

The aim is to bring together all the staff involved in a value stream to analyse current processes in an accelerated time frame. The staff then develop goals to achieve a new way of working which is implemented almost immediately. The focus is normally a production line or set of activities to be modified by frontline staff, rather than broad organisational activities.[31] Part of the successful adoption of Kaizen is that managers must acknowledge that the frontline staff have a greater understanding of the problems and are more likely to find ways of finding solutions. This level of trust should in turn enthuse staff to complete and accept the changes.[32] Research from the engineering sector, which utilises Kaizen events regularly, suggests three factors to promote their success:[33]

1. Goals of the event to be communicated clearly with the staff (including adequate opportunity for discussion);
2. Management agreement to not organise the events without full representation of all the staff involved in the value stream; and
3. Staff are permitted to implement the changes decided upon at the event.

2.1.5 The Toyota paradox

Many attempts have been made by other car manufacturing companies and industries to reproduce the TPS. Even though Toyota is extremely open concerning its practices, executives from thousands of different businesses have been unable to replicate Toyota's performance.[34] Spear and Bowen from the Harvard Business School spent four years visiting over 40 plants across the United States, Europe and Japan. The conclusion drawn by the researchers was that the common mistake made by most

observers is to confuse the system itself with the tools and practices observed during the visits. The paradox observed is that production line is rigidly scripted yet Toyota's operations are highly adaptable and flexible.[34]

Spear and Bowen described the unwritten business practices that make the Toyota Production System so successful.[34]

Rule 1: All work shall be highly specified as to content, sequence, timing and outcome.

Rule 2: Every customer–supplier connection must be direct, and there must be an unambiguous yes-or-no way to send requests and receive responses.

Rule 3: The pathway for every product and service must be simple and direct.

Rule 4: Any improvement must be made in accordance with the scientific method, under the guidance of a teacher, at the lowest possible level in the organisation.

The culture in the TPS is one of always learning and, if a problem arises, a scientific procedure is followed to make suitable changes. The changes are made at the lowest level possible (always by the people who do the work) and the company's business rules are so flexible that different organisational structures can co-exist in the same Toyota manufacturing plant.[34]

The TPS places extra emphasis on the connections between staff to reduce the ambiguity as to who to ask for assistance or request materials. This is to avoid the issue of "when something is everyone's problem then it becomes no one's problem." The workers are taught to seek help immediately once an issue is identified and not to try to find a solution themselves. This is counter-intuitive to most workplaces. If an issue is not raised, Toyota believes the problem will remain hidden and not shared or resolved. The problem then escalates and, when eventually dealt with, it has become much bigger and the real cause may have been lost. The solution to all problems lies in the root-cause. To ensure this model is successful, there are multiple links in the pathways for assistance. If the supervisor on the shop floor cannot help with a query they also have a designated superior, and this chain is repeated until the worker on the ground is linked to the manager.[35]

2.1.6 Evidence of Lean success

As the healthcare redesign field of research is relatively young, substantial evidence for the effectiveness for Lean (and healthcare redesign in general) is hard to find.[24, 36, 37] Reference manuals describe Lean tools, but are not helpful in understanding the effects associated with its implementation.[38] There are also opposing views in the literature regarding the success of Lean initiatives, with qualitative and quantitative studies often contradicting each other.[36] Health professionals are asking for hard evidence (ideally randomised control trials) to isolate any effects.[36, 39] The dilemma is that these experimental methodologies do not provide the evidence of success because they rule out context, content and application variables.[36]

Narrative reviews began to discuss this gap in the healthcare redesign literature in the early 2000s, citing that if studies were to be replicated, the 'how' and 'why' an initiative worked was just as important as the results.[14, 40] The literature is still very much divided on what is an appropriate evaluation study design. In a recent review of Lean interventions in healthcare, Moraros *et.al* concluded that none of the articles "used a high quality experimental study design (i.e. randomised control trial)"(p.51) and concluded that that there is not any data to support the claim that Lean interventions lead to quality improvements in healthcare.[41] The lack of evidence of Lean is supported by Andersen, who stated that studies which have an experimental design have trouble finding significant evidence of Lean success.[37]

Alternative types of evaluations are emerging in the literature sympathetic with the notion that healthcare systems are intrinsically complex. Walshe developed a rubric to help with the planning of quality improvement evaluations.[39] The basis of the rubric is that interventions contain four components; the context in which the intervention occurs, the content of the intervention itself, the process by which it is utilised, and the nature of the outcomes. Each of these components can be categorised as low variance (homogeneity) or high variance (heterogeneity). If an intervention has low variance across all domains, then an experimental method is appropriate as potential bias and

confounders are safely eliminated. As the variance increases, the value of an experimental method "becomes less clear" [39] (Table 2-1).

Table 2-1 Walshe's rubric for planning quality improvement interventions by examining variance across four domains

	Context (Situation/Setting of intervention)	**Content** (Characteristics of intervention itself)	**Application** (Process through which intervention delivered)	**Outcomes** (Results of the intervention)
Low variance (homogeneity)	All contexts similar e.g. human body physiological response to disease	Content clearly specified, standardised and highly repeatable e.g. dose of medication	Process the same for all e.g. protocol-driven therapeutic regime for a named condition	There is a single clearly measurable outcome e.g. survival over a given time period
High variance (heterogeneity)	Context vary widely e.g. significant differences between organisations	Content varies widely e.g. intervention tailored to an individual	Process varies depending on the situation e.g. skill and experience of staff	Multiple and less directly measurable outcomes which cannot be easily quantified e.g. behavioural changes

From Walshe pg. 58[39]

2.1.6.1 The effect of context in Lean evaluations

Context has been be defined as all surrounding factors not part of the intervention itself.[42] Lean initiatives are social, complex and inherently context dependent. The context changes over time as redesign initiatives are implemented because Lean is a system which feeds back on itself.[36, 43] This is a function of the intervention, not a methodological flaw with the evaluation.[40]

There have been 3 reviews of systematic reviews which have investigated facilitators for redesign success in hospitals. Andersen *et. al.* focussed on factors facilitating the intended outcomes from Lean interventions, [36] whilst Deblois and Lepanto studied barriers and facilitators in Lean and six sigma projects in acute care.[38] Despite the different methods, type of QI activity and area covered by the papers, Deblois and Lepanto identified similarity of their results to that of Andersen and colleagues:[38]

> In effect, the adaptation of the intervention to the local context, the implementation of multidisciplinary and multiskilled teams, decentralized decision making, the involvement of clinical leaders and managers as well as frontline, the recognition of a need for change, and

> the implementation of a quality culture fostering continuous improvement are reported as strong facilitators in both reviews.[38] (p.204)

In the third review of systematic reviews, Kringos *et. al.* agreed that contextual factors were poorly reported in the literature.[44] The authors used the MUSIQ tool[45] developed by Kaplan *et. al.* to research the contextual factors affecting quality improvement (QI) programs. The three most discussed contextual factors in the literature were:[44]

- support and capacity (functional IT systems, sufficient resources and administrative support were related to positive project outcomes);
- the microsystem (low staff morale and scepticism were barriers); and
- team composition (multidisciplinary teams which included physicians, subject matter experts on the area being changed, and the understanding of performance data were all essential facilitators of QI success).

Support from managers was mentioned in all three reviews and this can be provided in several ways including project sponsorship, financial support (this includes time away from usual duties and additional training in redesign techniques)[16, 30, 37] and the permission given by managers for staff to change processes.[46]

Mazur *et. al.*[47] describes professional behaviour change in the healthcare setting using Argyris and Schon's single- and double-loop learning theory. Single loop learning behaviour involves 'quick fixing' defects instead of analysing the root cause(s) of the problem. The problem is fixed quickly in order to move on to another task. In this type of behaviour, the issue is rarely reported to a higher authority. To promote double-loop thinking (initiating problem-solving techniques for long-term improvement to work practices) hospitals need to create an environment that rewards this type of behaviour.[47] The reason for this being extra time and effort is required on the part of the staff member to find a permanent solution for a problem. Management can promote double-loop behaviour by providing positive feedback to staff to acknowledge the extra effort and by ensuring staffing levels are adequate so that employees have time in their day to make real improvements.[47]

Tucker and Edmondson investigated the conditions in which hospital nurses responded to poor hospital processes by actively seeking to prevent future occurrence of similar failures (double-loop behaviour).[48] They divided process failures into two types; errors and problems. An error is an executed task that is either unnecessary or incorrectly carried out, and a problem is a disruption in a worker's ability to execute a task e.g. missing equipment or medication.[48] The authors found that out of 239 hours of observing 26 nurses in 9 hospitals, 86% (166/194) of process failures were problems. In 93% of the cases, the nurses did 'whatever it took' to fix the problem and continued with the primary task of patient care. This culture of busy health professionals taking personal responsibility to solve problems as they occur can create barriers to organisational improvement, as common underlying process problems are never addressed. Ironically, the satisfaction of self-sufficiency further decreases the chances of alerting management to common issues. Over time though, this technique of problem-solving produces burnout and frustration. Management can assist in promoting double-loop behaviour by being available to assist with problems, and by leading by example to create a safe working environment to discuss issues and to learn from mistakes.[48]

2.1.6.2 The effect of Lean on staff

The effect of Lean interventions on staff in the literature is mixed. A systematic review on Lean interventions on healthcare concluded an overall negative effect on worker satisfaction.[41] There is a common view that staff equate Lean with hidden cost-cutting measures. This may be due to managers using Lean as a toolbox to decrease waste rather than a philosophy.[18, 24] The basis of Lean practice is to respect people and their knowledge of frontline work processes.[25] If redesign initiatives are implemented with a limited understanding of core principles, the result at best will be "pockets of excellence" in departments with no overall change in organisational behaviour.[24, 25] Some

organisations have even abandoned the term Lean in favour of terminology familiar to the local context.[18]

In the analysis of the Lean implementation in Saskatchewan (Canada), a blunt lesson was learned regarding the power of the healthcare workforce.[49]

> …there is a fundamental contradiction in the messaging around Lean that says it is all about empowering workers and patients to improve quality by engaging them decision-making while imposing these processes from above and insisting that workers adopt a particular way of speaking about their work and a particular way of articulating solutions to problems they identify. (p.8)

Teamwork challenges have been discussed as a barrier when transferring Lean from manufacturing to health. One of the aims of Lean is to achieve efficiency through an even distribution of work.[25] Issues have arisen when the tasks assigned to assistants (usually nursing or physician) are deemed to cross professional boundaries.[25, 50] Problems can also arise when the reverse situation occurs – e.g. assigning nurses to tasks that did not require a professional qualification.[50] Traditional roles in healthcare are being constantly challenged with the emergence of new professional titles and a general reassignment of responsibilities.[46] Examples of such roles are positions that are in charge of functional areas, like bed flow manager and discharge co-ordinator. These jobs are created to improve patient flow and avoid patients being "parked" in areas where they cannot receive appropriate care.[46] This progressive model presents its own issues, as many of these positions require both operational and clinical judgement. Hospitals must develop career paths and appraisal systems to evaluate both individual and each team's performance, in addition to appropriate IT systems, to maximise the benefits of these new roles.[46] Many physicians are wary of Lean, as it has been viewed as decreasing professional autonomy.[49, 51] A suggested way to counter-act this belief and to engage health professionals is to only standardise repetitive activities like information flow and communication, whilst allowing non-repetitive activities to remain individualised.[52]

2.1.7 Lean in the public sector

Lean is appealing to the public service sector as being able to 'do more with less'.[24] Again a major problem is the focus on the toolkit without understanding the principles and context. Radnor and Osborne identified three challenges in implementing Lean in the public sector:[53]

1. A service is provided and not manufactured goods
2. The focus of the operating systems is internal and not external
3. The indicators of success are different

Determining who the customer is in healthcare is difficult – is it the taxpayers as a group or the taxpayers as individual patients? Public services are innately capacity-led and thus there is limited ability to influence demand[54] or use freed-up resources to increase the business.[53] As well as efficiency and cost cutting, public services must be equitable and in the case of healthcare they are frequently teaching institutions, with undergraduate health professionals and medical practitioner training programs. Radnor and Osborne even suggested that the success of Lean in the public service is due to the initial poor system design. Lean was just the catalyst to address the inefficiencies of existing internal organisational processes.[53] They argued that true gain from the application of Lean will only occur after a cultural change by the public service sector, when there is a genuine partnership between the health professionals that deliver the services and the end-users. This alters the service model from being policy oriented to end-user oriented, and then the true concept of value can be defined.

2.1.8 Redesign in outpatients

A structured search of five electronic databases (Medline, CINAHL, EMBASE, ProQuest and Scopus) was undertaken for research published in the English language up to June 2015. These searches were repeated in November 2018. The search terms used were: ophthalmology, plastic surgery, outpatient*, patient flow, efficiency, clinical redesign, Lean, service operations, process assessment, clinical process, health care reform, appointment scheduling, no-shows, overbooking, Did Not Attend,

turn-around time, dwell time, wait* time, wait* lists, flow* and clinic. There was no restriction on the type of study, with quantitative and qualitative studies included. A snowballing approach was also used to identify previously missed literature.

A significant portion of the literature concerning a decrease in outpatient wait times and clinical redesign in outpatients are case studies from a single site. In a recent systematic review of strategies to decrease outpatient wait times, the authors stated that none of the studies reviewed demonstrated an association between the solutions and a change in outpatient wait times.[55] However, Naik*er* et.al were able to categorise the strategies used into three themes: resource alignment, operational efficiency and process improvement. Resource alignment included initiatives to ensure that only the most appropriate patients were included on the wait list (21 % of the studies). These strategies listed included wait list audits, discharging patients back to community care and initiatives to limit the number of referrals. Operational efficiencies (18% of the studies) were concerned with maximising clinic capacity (e.g. improved allocation of appointments), and most papers (61%) involved process improvement on a strategic level e.g. no-show modelling, telemedicine. The authors concluded these strategies serve as a starting point, but further research is needed into organisational culture and attitudinal factors affecting wait times so that a coordinated collaboration of stakeholders can improve the wait time for patients.[55]

Outpatient and ambulatory service managers in Victoria, Australia were surveyed on their perceptions of the factors that contribute to wait times.[56] Twenty-six services participated with typical wait times of 2 weeks to 12 months. Of the four themes identified, only one related to patient factors (high demand for services). The other reasons were internal – inefficiencies in the intake process, management of human resource issues and staff acceptance of the wait times (especially for the client population with chronic conditions who may view wait times as not a priority). The authors noted that a lack of flexibility in the way services were delivered was an underlying factor among the providers e.g. staff were not replaced during periods of anticipated leave causing a patient backlog which was

then hard to clear. These issues were noticed more in smaller services. As increasing the staffing may be resource-prohibitive, the researchers suggest that other novel strategies mentioned in the literature can also be used to balance supply and demand. This includes tightening the eligibility criteria and implementing interventions that reduce the number of inappropriate referrals.[56] These approaches would be included under the 'resource alignment' theme mentioned by Naiker et.al.

Lean redesign methodology has been successful in redesigning healthcare processes which involve a linear sequence,[38] and in processes which are uncomplicated.[57] The emergency department is often chosen as the area to begin clinical redesign in hospitals.[22, 32] Other suitable areas are laboratories [58] radiology,[59] pharmacy (including manufacturing),[60] operating theatres[61] and outpatient/primary health clinics.[25, 62-64]

Lean or Lean six sigma is a popular choice of redesign methodology for hospitals areas where flow is linear and predictable. In outpatient clinics, the value stream is often patient movement during a clinic session. It begins with the patient arrival (usually at a registration desk) and ends with the patient departing the clinic. In an otolaryngology clinic, Lin et. al. used time stamps to track patients during their appointments and used this information to identify areas of flow constraints. Stepwise regression was undertaken to identify the areas where significant delay was occurring, and solutions were implemented over a six-month period. The interventions included improved signage, a streamlined registration process and an alteration of the area where the initial examination took place. This resulted in a statistical improvement in on-time clinic starts and a decrease in registration personnel walking 75 metres per audiology patient.[65]

Ophthalmology clinics are known for long dwell times (the time between patients arriving and departing the clinic). This is due to patients having long wait times between the different phases of their clinic visit [66] and the rising complexity and numbers of diagnostic tests and treatments available in the outpatient setting.[62] In a bid to decrease the time that patients spent waiting but increase the time spent with healthcare providers, Wong *et. al.* devised solutions designed to standardise common

processes e.g. clarifying staff roles and responsibilities, establishing a patient-tracking board and making common administration forms available throughout the clinic. Patient dwell time decreased, on average from 115 to 85 minutes, and time spent with healthcare providers increased from 21% to 31% of dwell times.[67] Other Ophthalmology redesign solutions have utilised streamlined patient pathways and adjusting staffing to high demand tasks[62] and equipment relocation.[66, 67]

Another potential area for outpatient clinic redesign is to decrease the time from the receipt of the referral to the first appointment. After clearing a backlog of 495 patients on the wait list, Willis *et. al.* was able decrease the wait time for first appointment from 54 to 9 days. This was achieved by offering extra services during an appointment so that a smaller number of patients required a second appointment.[68] Although the authors state the methods could be adapted to other hospital outpatient services, it was unclear if the staff rearrangements were cost-neutral, as the context was not discussed in enough detail.

Many of the novel methods of decreasing outpatient waiting times originate in the United Kingdom, where the NHS in each country has target times from referral to the first consultant appointment. England has a maximum two-week wait target for an urgent cancer referral appointment.[69] A London gastroenterology hospital established a 'paper clinic' where patients who required further investigations were not given a follow-up appointment; instead their details were recorded on a 'paper clinic' form. Each fortnight a surgeon and nurse consultant formally reviewed the results of the investigations of the 'paper clinic' patients and 64% of the patients did not need to return in person to the clinic as their follow-up requirements were handled by a telephone consultation.[70]

In summary, the linear sequence of outpatient clinic workflow is a suitable area for Lean redesign methodology. Understanding the context in which change occurs is beginning to be an important focus of clinical redesign research. Managerial support is essential in giving permission for the staff to suggest areas to be changed, as well as allocating enough resources (time, administration and education) for transformation to occur. If the hospital does not foster favourable conditions for

change by assisting problem solving efforts, managers will not be able to engage employees in system improvements.

2.2 Outpatient clinics in Australia

Outpatient care is a form of secondary healthcare (care provided by a specialist or facility upon referral by a primary care physician which requires more specialised knowledge, skill or equipment than the primary care physician can provide).[71] In Australia, patients consult specialist medical practitioners (or allied health practitioners or nurses), or have diagnostic and other procedures without being admitted to hospital.[72] Most public outpatient care is delivered on a hospital campus (80% of individual appointments); the rest occurs in the community, the patient's home, by telephone or video link.[73] Referrals originate mainly from GPs (or other specialist doctors), but in some specialties referrals are accepted from a nurse or allied health professional. The referral criteria for each hospital clinic is locally determined. A GP to specialist referral is valid for 12 months from the date of the initial appointment or longer if specified by the referring doctor and a specialist-to-specialist referral is valid for three months or for a single course of treatment, as per Medicare guidelines (Australia's universal health care program).[74]

2.2.1 Outpatient statistics collected in Australia

The Australian Institute of Health and Welfare (AIHW) was established by an act of the Australian parliament to provide statistics on Australia's health and wellbeing. The AIHW releases about 180 publications each year, including an annual national non-admitted patient care report.[75] This document amalgamates appointment statistics supplied by Australian public outpatient clinics from the previous financial year.

Hospitals submit data to AIHW, which is then collated by AIHW's Metadata Online Registry (METeOR). METeOR specifies the data elements which are to be supplied by the outpatient clinics. [73] The most recent report: *Non-admitted patient care Australian hospital statistics 2016-2017,* contains appointment information presented under the following headings:[76]

- How many non-admitted patient service events occurred?
- What type of care was provided?
- Who used these services?
- How were the services provided?
- Who requested the service?
- How were the services funded?

The value of the information in this yearly report for clinicians, managers and the public is very limited. All the data supplied in the report describe appointments that have already occurred. At a national level, wait list, outcome or safety data is not collected.

The AIHW only collects elective surgery waiting time statistics from the date when a specialist adds a patient to the public surgical wait list. Waiting time information is not collected for those patients who attend an outpatient appointment but do not require surgery or for surgery undertaken in private hospitals.

Even when using the available data, outpatient clinic attendances in Australia cannot be analysed over time. Outpatient appointment attendances between 1993 and 2014 were published as a time series. Subsequent reports for 2015, 2016 and 2017 have been stand-alone documents due to the change in the definition (and subsequent reporting) of an appointment in 2015.

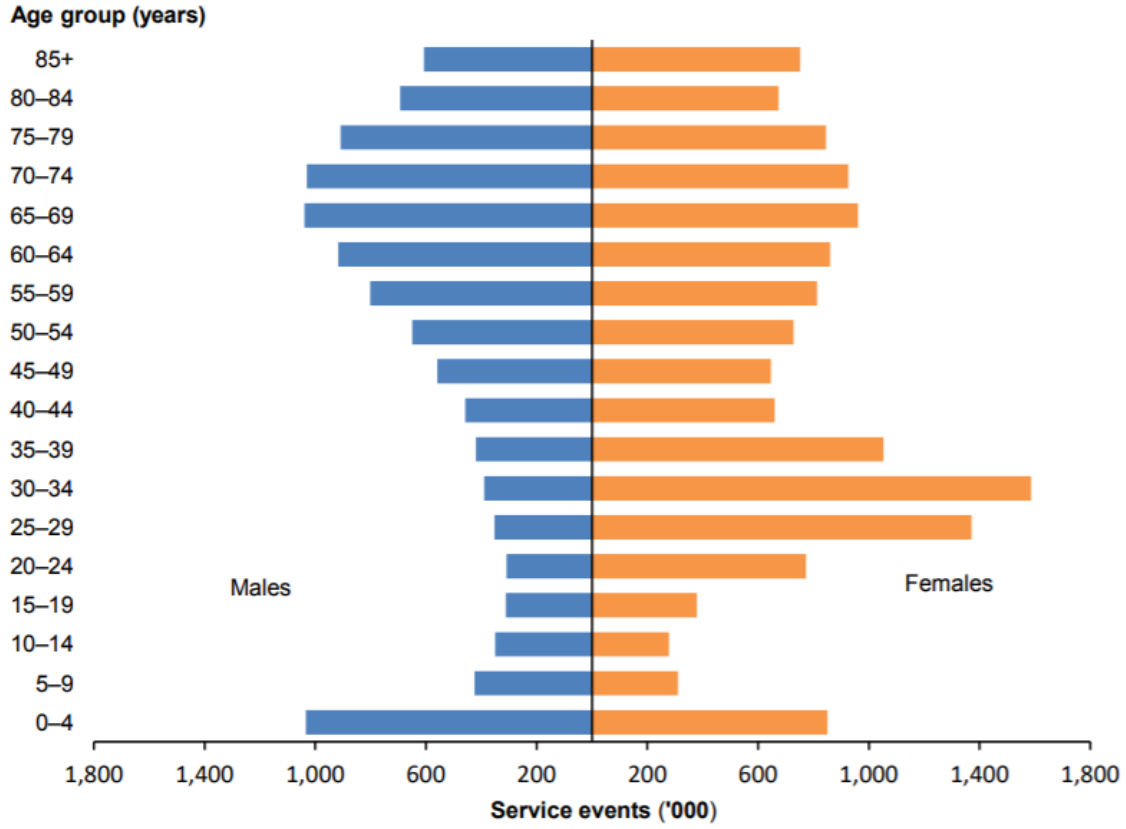
2.2.2 Outpatient attendance demographics in Australia

As per the AIHW, there were 36.7 million service events (appointments) reported in 2016-2017. A service event is categorised as:

> an interaction between one or more health-care provider(s) and one non-admitted patient, which must contain therapeutic/clinical content and result in a dated entry in the patient's medical record.[76]

These services were provided by 602 public hospitals and 31 other services. People living in major cities made up 67% of appointments. Approximately 56% of service events were for females, 33% were for people aged 65 years and over (this age group comprised 15% of the population). About 5% of service events were for indigenous Australians. Figure 2.2 shows the analysis of service events by

age and gender. Obstetric appointments mainly account for the increased proportion of female outpatient appointments between the ages of 20 and 39 years.[76]



Taken from [76]

Figure 2.2 Outpatient service events by age group and sex in Australia, July 2016 - June 2017

The 36.7 million non-admitted patient service events were divided into one of four clinic types.[76]

- Procedural clinics—provided by a surgeon or other medical specialist (e.g. dental and radiation oncology treatment) 8% of service events
- Medical consultation clinics—provided by a general physician or medical specialist (e.g. cardiology consultation) 32% of service events
- Stand-alone diagnostic clinics—provide diagnostic services within a specific field of medicine or condition (e.g. pathology and medical imaging) 15% of service events
- Allied health and/or clinical nurse specialist clinics (e.g. midwifery, optometrists, speech therapists) 45% of service events

These appointment divisions are for administrative purposes only. They do not necessarily represent how clinics function in the healthcare environment. In practice, allied health and nurse clinics

regularly operate in conjunction with medical or procedural clinics. For example, physiotherapists are often part of a multidisciplinary team working in an orthopaedic or plastic surgery clinic.

2.2.3 Limitations of Australian outpatient statistics

Individual hospitals are responsible for the quality of the data supplied to METeOR. As there are variations in how hospital services are defined and counted, the reporting of service events to the AIHW varies between states and territories (and even within jurisdictions). [73]

Comparing trends over time within states and territories is also difficult. In 2014-15, the largest clinic in New South Wales by number of service events was *General Practice and primary care clinics*. In the following year (2015-16) when the reporting criteria changed, this clinic did not make the top 10 clinic categories by appointment numbers.[72, 73] The reporting requirements are so complex that differences in attendance figures can even be the result of a variation in the funding arrangements between clinics.[73] Due to these reasons, it is not possible to compare clinic attendances between hospitals in each state and territory using the current AIHW data. This makes large-scale planning of services difficult when current usage cannot be accurately determined.

2.2.4 Tasmanian outpatient appointment data

The AIHW reports do comment on data variations between the collection periods, but the reasons behind these variations are not always obvious. For example, even though the 'number of individual non-admitted patient occasions of service' (the then definition of an appointment) was collated yearly from 2009-10 to 2013-14, in a disclaimer below the table the authors note:

> From 2010-11, Tasmania was able to exclude counts of outpatient occasions of service (appointments) provided at public hospitals by private specialists. In 2009–10, these were included in Tasmania's public hospital counts.[77](Table S3 If).

This anomaly refers to medical practitioners who were employed on a sessional basis in clinics (who were not in-house staff specialists). These doctors did not have their patients' appointment statistics included in the AIHW reports. The reason for the exclusion is unclear. In Tasmania, two public

hospitals provided the majority (94.6% in 2013-14)[77] of the individual occasions of service, but it is unclear if the proportion of private specialists remained constant over this five-year period. Any such variation may have contributed to the large increase in reported appointments between 2012-13 and 2013-14 in Table 2-2.

Table 2-2 Individual occasions of service (appointments) in Tasmania 2009-2010 to 2013-14 [77]

Year	**2009-10**	**2010-11**	**2011-12**	**2012-13**	**2013-14**	**Average change since 2009-10**	**Change since 2012-13**
Occasions of service	336 559	359 870	328 694	308 965	386 425	3.5%	25.1%

Taken from [77] (Table S3 If)

Comparing clinic attendances over time for each specialty (in each state) is complicated by the change in reporting requirements to METeOR in 2014-15. As an example of the change in published data between 2013-14, 2014-15, and 2015-16, Table 2-3 compares Tasmanian appointment data by speciality (using a different data set from Table 2-2).

Table 2-3 AIHW appointment data for Tasmania between 2013-14 and 2016-17

Outpatient clinic type	Tasmania Non-admitted patient service events (appointments) aggregate data 2013-14	Tasmania Non-admitted patient service events (appointments) 2014-15	Tasmania Non-admitted patient service events (appointments) 2015-16	Tasmania Non-admitted patient service events (appointments) 2016-17
Orthopaedics	25 694	18 992	27 848	29 474
Obstetrics	5 750	14 141	9 953	-
Obstetrics – complex pregnancy	-	-	-	3 096
Obstetrics – pregnancy without complications	-	-	-	8 758
Medical oncology (consultation)	20 108	3 254	1 869	4 728
Ophthalmology	9 714	7 675	6 306	9 871
General surgery	14 053	13 987	13 872	13 656
General Medicine	24 109	28 891	unknown	unknown
Radiation oncology (consultation)	74 390	unknown	4 987	unknown
Endocrinology	9 542	9 061	8 167	8 741
Cardiology	7 291	7 382	6 753	unknown
Gynaecology	8 642	9 143	9 467	9 629
Other	98 351	100 361	97 929	108 937
Totals	**297 644**	**212 887**	**189 288**	**202 071**

Data compiled from [72, 73, 76, 77]

As shown in Table 2-3, medical oncology and radiation oncology appointment figures were noticeably different in the four reporting periods; this is highlighted by the authors in the 2014-15 report - "data presented for non-admitted service events in this report are not comparable with data reported for non-admitted occasions of service in earlier reports."[73] This corresponds to the reporting period when the definition of appointment was changed. In 2016-17, obstetrics was divided into two clinic types for the first time - complex pregnancy and pregnancy without complications.

Despite these data limitations, the AIHW concluded that between the periods of 2009-10 and 2013-14, the number of outpatient appointments increased by 2.5% on average each year in Australia.[77] No conclusions were drawn in the 2014-15, 2015-16 and 2016-17 reports, due the change of appointment definition. Also, no conclusion can be made regarding the trend in Tasmanian outpatient appointment figures over time.

These examples illustrate the complicated reporting of outpatient clinic attendance by AIHW, and how the data is of questionable value to end-users, system managers and healthcare providers. The following sections discuss some approaches in which other countries make outpatient data publicly available, especially concentrating on waiting times.

2.2.5 International outpatient statistics

As in Australia, international waiting time data is concerned mainly with elective surgery. The OECD (Organisation for Economic Co-operation and Development) compiles statistics and writes reports "to promote policies that will improve the economic and social well-being of people around the world."[78] OECD *Health Statistics* is a yearly description of the health status of its 35 member countries. It comprises an interactive website where users can search health indices by country. *Waiting times* is one such index. The waiting times (mean, median and percentage of all patients waiting more than 3 months) for each country are tabled back to the year 2000 for the selected elective surgical procedures of: cataract extraction, coronary artery bypass graft, prostatectomy, hysterectomy, total hip replacement and total knee replacement. Waiting time is defined as the time between when patients are added to the non-emergency (elective) surgery waiting list (following specialist assessment) to the date they are admitted for treatment. Outpatient waiting time is excluded from the data collection.[79] Interestingly, the same website compares *Health Care Quality Indicators* between countries. Under the heading of *Patient Experiences,* there is an indicator titled *Waiting time of more than four weeks for getting an appointment with a specialist.* The latest comparative data is from 2013 and 2016, for patients aged 16 years and over (Figure 2-2).[80] Australian public and private sector data showed the proportion of adults waiting longer than four weeks to obtain a specialist appointment decreased from 46.2 to 22.4 per 100 adults from 2013 to 2016.[80]

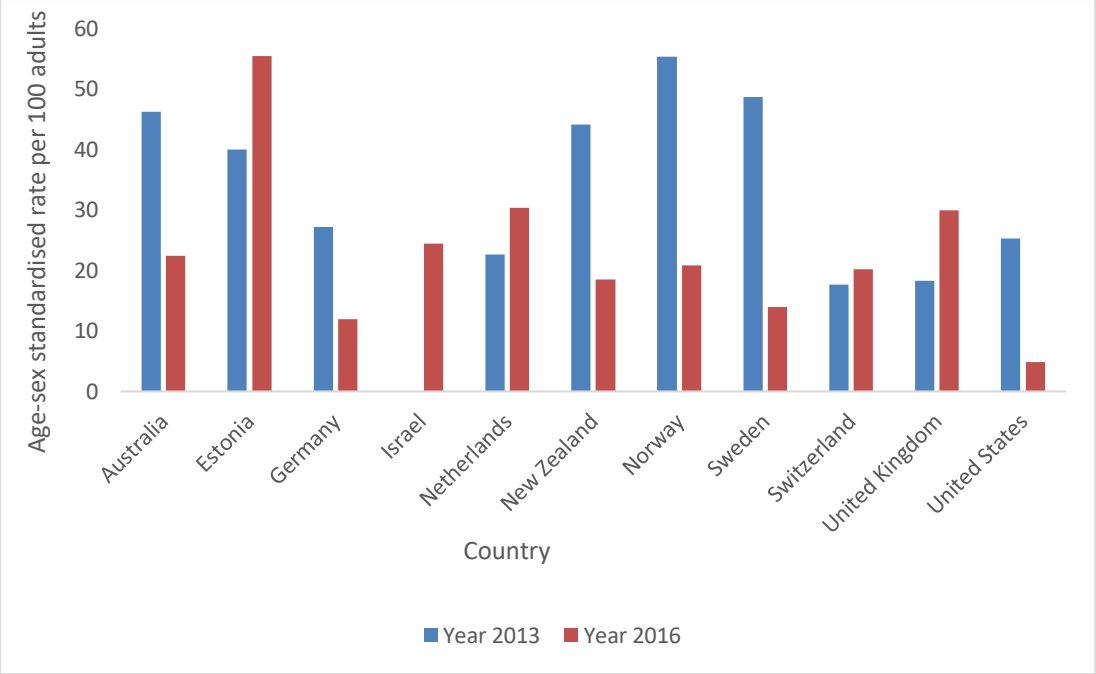


Figure 2.3 Waiting longer than four weeks to obtain an appointment with a specialist in different countries *(80)*

Waiting times were compared in 23 OECD countries in the peer-reviewed article *International comparisons of waiting times in health care – limitations and prospects.*[(2)] Despite using the broad search terms of "waiting time" "waiting list" and "health care", the search focussed only on elective surgery as this was noted as the most common internationally measured waiting time. The time between GP referral and the first specialist outpatient appointment was not included due to variation in the referral processes between countries.[(2)]

Although not specifically discussed in the article, many European countries and the United States do not require the GP to be the gatekeeper to see a specialist physician/surgeon. When patients are able to directly consult specialist physicians, access issues to secondary healthcare are difficult to monitor. Fifteen of the 23 OECD countries in the study collected and published waiting time data at the national level. The authors noted from the reports examined, none relied solely on official national statistics to compile the data. The article included a diagram to illustrate the various time points each country uses to compile statistics on waiting time information (Figure 2.4)[(2)] This figure shows that the monitoring of waiting time starts later in Australia and Ireland than in any of the other countries (when

the patient has been listed for treatment by the specialist). By contrast, Sweden measured waiting times at several points in the patient journey, starting with time to telephone contact the GP, as well as the decision to refer to specialist treatment, and the decision to treat.[2]

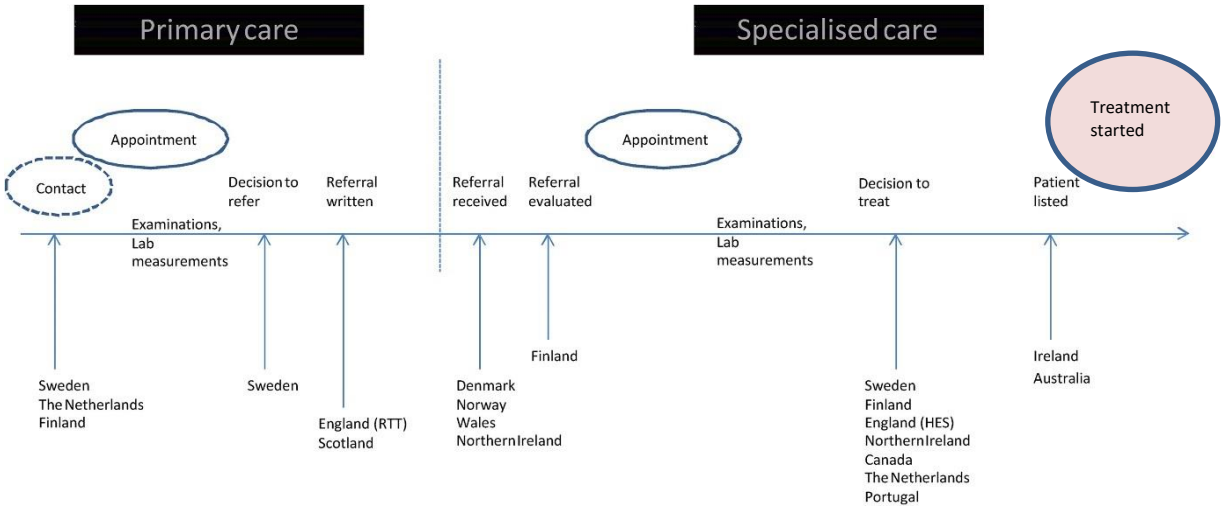


Figure 2.4 Difference in starting points for measuring waiting times in different OECD countries [2])

2.2.6 Referral-To-Treatment time

With many health systems fragmented into distinct primary, secondary and tertiary care, some countries are monitoring the entire patient journey. The period from GP referral to treatment by the specialist is termed 'Referral-To-Treatment' (RTT). The aim is to track and minimise the entire wait and not just concentrate only on one section, which in the past has been dominated by the surgical wait time. Hidden (and undocumented) waiting is just as important to the patient as the time spent on the surgical wait list e.g. the time taken for investigations and the number of appointments required before a treatment plan is decided.[81]

Three of the four United Kingdom countries monitor RTT time, but do not currently agree on a uniform benchmark. For non-urgent conditions, England[69] and Scotland[82] both aim for a RTT of 18 weeks. Cancer and mental health referrals have shorter targets. Wales publishes monthly data on the percentage of patients whose RTT pathways are longer than 26 weeks.[83] Northern Ireland's goal is to have less than 50% of patients waiting more than 9 weeks for a first consultant-led outpatient appointment. [84] All this information is publicly available on each country's NHS website.

2.2.7 Describing waiting times

Allocating a numerical value to how long a patient waits for a consultation/treatment is not straightforward. At a glance it seems an unambiguous process indicator of care, but a detailed view shows wait times are difficult to interpret and serve different purposes for different stakeholders.[85] Viberg *et al*.[2] discussed three of the most common methods of documenting waiting times in health.

1. ***Completed waits***: a retrospective look at the waiting times of patients who have already received care.
2. ***Ongoing waits***: waiting time for those patients on the waiting list at a census date. Although incomplete, it provides a snapshot of the provider's situation and it includes those patients who never receive treatment.
3. ***Expected waiting time***: this is a prognosis for new patients. This method is rarely used in official documents, as it does not measure an actual waiting time.

Completed waits are usually measured in days/months. Some common measurements include: mean, median (less sensitive to outliers), 90th percentile (the period in which 90% of the patients have been seen) and the 95th percentile. The 90th and 95th percentile focus on those that are most disadvantaged – the patients who waited the longest before attending their first appointment. *Completed waits* only includes patients who have received care.

Parameters used for *Ongoing waits* may or may not differ from *Completed waits*. As this value is taken on a census date, it reflects all the patients on a wait list including those that have not been seen and those who will never be seen. Examples of *Ongoing wait* parameters include: number of patients on wait list, number of patients waiting per time interval or the 90th percentile (the period in which 90% of the people on a wait list have been waiting). The number of patients waiting as a single parameter is not useful, because it does not give an indication of the frequency with which new patients are seen. It is more useful to combine this figure with another measurement, such as the median wait time or 90th percentile.[2]

The *Completed waits* answers questions like "How long did patients wait who were treated in January 2018"? *Ongoing waits* are used to answer the question "On the 31st of January 2018, how long have the patients who are currently on the list been waiting?"

If a wait list is not audited at regular intervals to remove those patients who no longer require treatment, die or have had treatment elsewhere, the *Ongoing waits* value will be artificially increased. The downside of using *Ongoing waits* is that the patients are still waiting (and it is not known when they will be seen).[86] Both measures are legitimate depending on the question, but direct comparisons of the two figures are not.

2.2.8 Who uses wait list data?

At least four different groups with different demands can be identified as stakeholders of wait list data.[87]

- patients
- healthcare professionals (including referrers)
- managers
- politicians

The *Expected waiting time* is of most interest to new patients and referrers. Healthcare providers are concerned with the length of the wait list and how long their current group of patients have been waiting. Waiting time data is a performance indicator for managers and comparisons of different hospital units over time is useful for planning. Policymakers and politicians have an interest in efficiency, and waiting times serve a gauge of public access to healthcare and a useful comparator between hospitals or specialties.[87]

There are multiple examples in grey literature examining factors contributing to long outpatient wait times.

- Measuring and comparing waiting lists. A study in four European countries[88]
- The specialist outpatient services implementation standard (Queensland, Australia) [89]
- Real patients coming to real harm: Ophthalmology services in Wales [90]
- Access to specialist clinics in Victoria (Victoria, Australia)[91]
- Expert panel on waiting list management: Report to the Minister for Health (Victoria, Australia)[92]

Some reports are concerned solely with outpatients and others concentrate on elective surgery wait times, which contain embedded outpatient data. Many of the findings remain as reports and are not translated into peer-reviewed literature. There is little incentive for the authors to publish the outcomes in journals, which also may not be accepted as 'true research'. This is disappointing as many reports are in-depth and of high quality and would be beneficial to other health care organisations.

It is prudent to note the source of the data when quoting statistics from grey literature. The Fraser Institute in Canada publishes an annual report 'Waiting your turn: Wait times for Health Care in Canada'. The median wait from referral by GP to specialist appointment by province and specialty are collected. Data collection is achieved by a survey sent to doctors in 12 medical specialties across the 10 provinces and, in 2017, the overall response rate was 21%.[93] The shortest median wait times were in Ontario (6.7 weeks) and the longest in New Brunswick (26.6 weeks). The specialty of neurosurgery had the longest median wait time from referral to specialist appointment (22.1 weeks), whilst unsurprisingly radiation oncology and medical oncology had the shortest wait time (1.4 weeks and 2 weeks, respectively). The median wait time for an ophthalmology appointment was 13.4 weeks and 14.1 weeks for a plastic surgery appointment. As only one in five doctors responded to the survey, the reported results may reflect a bias to either under- or over-report waiting times. Additionally the survey also relies on the specialists' accurate documentation of their own waiting periods.[93]

2.2.9 Wait list categories in Australia

In Australia there is a wait list priority system for outpatient appointments, but there is currently no national consensus on the number of urgency categories. Most hospitals employ three urgency categories (similar to those used for surgery), although there are only two urgency categories in the state of Victoria. In Tasmanian public outpatient clinics, referrals are triaged according to urgency in one of three categories. The following is the definition of wait list categories used by public Tasmanian hospitals:[94]

Category 1
Appointment within thirty (30) days is desirable; and
Condition will require more complex or emergent care if assessment is delayed; and
Condition will have significant impact on quality of life if care is delayed beyond thirty (30) days.

Category 2
Appointment within ninety (90) days is desirable; and
Condition has potential to require more complex care if assessment is delayed; and
Condition has the potential to have some impact on quality of life if care is delayed beyond ninety (90) days.

Category 3
Appointment is within 365 days is desirable; and
Condition is unlikely to deteriorate quickly; and
Condition is unlikely to require more complex care if assessment is delayed beyond 365 days.

If a patient does not fulfil all criteria for Category 1, then the patient is allocated Category 2 status. If a patient does not fulfil all criteria for Category 2, then the patient is allocated Category 3 status.

As southern Tasmania has only one tertiary referral hospital, all the public outpatient referrals are faxed direct to the specific outpatient clinic at the RHH. The same situation applies to the other three main hospitals across the state as each clinic manages its own wait list.

2.2.10 Publicly available waiting time data in Australia

There is no requirement for hospitals to make outpatient wait list data publicly available and there is no mechanism to report this data to METeOR. The *My Hospital* website is an Australian Government initiative which publishes data collected through METeOR. A search function allows the user to type in the name or location of a hospital and statistics regarding hospital performance are displayed. Hospital statistics are provided under the following headings.[95]

- Hospital profile
- Safety and quality (healthcare associated infections and hand hygiene)
- Waiting times for surgery
- Time spent in hospitals and emergency departments
- Financial performance

Although collected by METeOR, outpatient attendance data is not displayed on the *My Hospital* website. As the data is only concerned with the number of appointments in the previous year, it is of minimal significance to referrers and new patients trying to access the system. The AIHW does

recognise there is a problem with data continuity as the following statement was reproduced from the biennial health report *Australia's Health 2014*[96]

> Currently it is not easy to profile 'patient journeys' as they progress through and receive services from different parts of the health system. Such information could be very useful in providing insights into the overall effectiveness and efficiency of our health system.

This statement acknowledges the importance of a strategic approach to collect, report and manage national health data, which would help to inform a tailored approach to mapping health priority areas.

2.2.11 Nationally collated outpatient waiting time data in Australia

The Australian data in Figure 2-3 (Waiting time of more than four weeks for getting an appointment with a specialist) was extracted from the Australian Bureau of Statistics (ABS), annual Patient Experiences telephone survey.[97] The ABS collected the results of the same survey in three consecutive years (2013-14 to 2015-16) and the results are displayed in Table 2-4. The Tasmanian data was published for the year 2013-14 only.

***Table 2-4** Adult experience of medical specialist services over a 12-month period (2013-14 to 2015-16)*

Survey question	2013-14 Australia	2013-14 Tasmania	2014-15 Australia	2015-16 Australia
Needed to see a medical specialist?	39%	40.4%	40.9%	39.2%
Saw a medical specialist?	36.2%	36.4%	38%	36.3%
Needed to see, but did not see a specialist in the previous 12 months?	7.1%	9.6%	6.9%	7.4%
Waited longer than felt acceptable to get an appointment to see a medical specialist?	25%	28.1%	23.9%	22.8%

Extracted from patient experiences surveys conducted by the ABS from 2013-14 to 2015-16[97, 98]

At the state and territory level, in 2013-14 Tasmania had the highest proportion of people who needed to see a medical specialist but did not see one in the previous 12 months. In the same year, Tasmania had the third highest proportion of people who reported they waited longer than they felt was acceptable to get an appointment (Tasmania 28.1%, ACT 30% and NT 33.2%). The national average

for that period was 25% of respondents waiting longer than they felt was acceptable. Individual state data has not been published since the 2013-14 report.

In contrast to these results, in another the ABS survey (Health service usage and related actions, Australia, 2014-15), only 7.9% of respondents in 2011-12 and 7.5% in 2014-15 visited an outpatient clinic in the previous 12 months.[99] Many specialists have private consulting rooms (outside the hospital environment) and patients may not have considered a private consulting room as an outpatient appointment. This is a possible explanation for this lower figure compared with Table 2-4. The data in Table 2-4 included both patients who attended outpatient clinics in public hospitals and private specialist clinics.

2.2.12 Outpatient waiting times published by state health departments

To investigate which Australian state health departments display publicly available outpatient waiting times, an internet search was undertaken (in March 2016 and repeated in April 2018). The terms "outpatient wait time" and "outpatient wait list", in addition to the name of each state/territory, was entered into the Google™ search engine. If no results were found, the same search terms were then typed in each state government/territory website. Outpatient waiting times for clinics at two Tasmanian hospitals and all Queensland and Victorian hospitals is publicly available. Western Australia, New South Wales, South Australia, ACT and the Northern Territory do not publish comparable outpatient wait list data on each government website (as of April 2018).

Wait list information is not reported in a uniform manner between the hospitals; Victoria only has 2 urgency categories and the other two states have three urgency categories. Tables 2-5 and 2-6 contrast the available wait time metrics, using Ophthalmology clinics chosen from Victoria and Queensland, which are of similar size to the RHH clinic. The RHH reports the waiting time of the 75th percentile on a census date (*ongoing wait*). The 75th percentile is a statistic not commonly reported in the literature. The usual values are the 90th/95th percentile to give an indication of the wait time of the longest waiters.[2] In contrast, Queensland displays quarterly information for the 90th percentile

waiting times for each clinic in each hospital (*completed waits*). As an example, the triage category 1 wait time for the 90th percentile at the Gold Coast University Hospital was 47 days from October – December 2017[100]. This indicates that 90% of patients attended their appointment in 47 days or less, from the date of the hospital receiving the referral (Table 2-5). Queensland also reports an *ongoing wait* - 'the percentage of patients waiting within the clinically recommended time' for each triage category on a census date. On 1st January 2018, 48% of category 1 patients at the Ophthalmology clinic at the Gold Coast University Hospital had been waiting 30 days or less.[100]

In contrast, Victoria publishes median and 90th percentile *completed waits,* but for only urgent (identical to category 1) and routine (all other patients).[101]

Table 2-5 Urgent Ophthalmology outpatient waiting times in three similar Australian hospitals

Waiting time metric	Barwon Health Victoria (Urgent*)	Gold Coast University Hospital Queensland (Category 1*)	Royal Hobart Hospital Tasmania (Category 1*)
90th percentile of days waited by patients attending appointments (October-December 2017)	54	47	
75th percentile of days waited by patients still on the waiting list (ongoing wait)			106
Median number of days waited by patients attending appointments, October- December 2017	8		
% of patients on the waiting list whose current waiting is within the clinically recommended time, at 1st January 2018 (ongoing wait)		48 %	

*Category 1/Urgent target is to have the first appointment within 30 days of the clinic receiving the referral.
Data taken from [94, 100, 101]

Table 2-6 Non-urgent Ophthalmology outpatient waiting times in three similar Australian hospitals

Waiting time metric	Barwon Health Victoria (routine) target < 365 days	Gold Coast University Hospital Queensland		Royal Hobart Hospital Tasmania	
		Category 2*	Category 3**	Category 2*	Category 3**
90th percentile of days waited by patients attending appointments (October-December 2017)	749	385	611		
75th percentile of days waited by patients still on the waiting list (ongoing wait)				147	287
Median number of days waited by patients attending appointments, October- December 2017	266				
% of patients on the waiting list whose current waiting is within the clinically recommended time, at 1st January 2018 (ongoing wait)		28%	66%		

*Category 2 target < 90 days, **Category 3 target < 365 days
Data from [94, 100, 101]

As previously stated, there is no nationally agreed outpatient priority waiting system as Victoria has only two urgency categories. There are also wait list management policy differences between the states. Patients remain on the wait list until they attend their first appointment in Tasmania and Queensland.[102] As patients remain on the wait list until the first appointment is attended, if multiple patients fail to attend their appointment this results in extended wait times for that clinic. This practice is in contrast to Victoria, where patients who fail to attend a booked appointment (without notice) are removed from the wait list statistics.[91] This practice may make it appear that Victoria has less patients waiting for an outpatient appointment and that the waiting time is shorter than the other two states. Some states suspend the waiting period for patients who are not ready for care (e.g. in Queensland, but not Tasmania).[102] If a patient is upgraded from a category 3 to 1, Queensland excludes the length of time the patient was waiting in a lesser category,[102] whereas Tasmania continues with the original waiting time (personal correspondence with the program officer).

In an online independent article published this year, Professor Stephen Duckett refers to the wait time to see a specialist in Australia as the "hidden wait list"[1]. As each state has a different approach to

reporting waiting times to see a specialist, making national comparisons is difficult. This problem was first mentioned in a 2000 Senate Committee Report which highlighted long outpatient waiting times across the country, as did a 2005 report in Queensland, and again in the latest South Australian review about delays in the public health system (2018).[1]

In summary, due to minimal reporting requirements at a national level, outpatient activity is poorly reported and assembled in Australia. Only when an accurate data set of outpatient activity (linked to surgical activity) is compiled, can areas of need be fully addressed. Until then referrers, patients and service planners are navigating a hospital system in which primary, inpatient and outpatient care are disjointed.

2.2.13 Overdue follow-up appointments

As well as allocating *New* or first appointments from the wait list, outpatient clinics also manage *Review* appointments. A *Review* or follow-up appointment is a review consultation following a previous outpatient appointment, inpatient treatment or attendance at the emergency department of the same hospital. The Royal National Institute for the Blind first identified the issue of overdue follow-up appointments in 2014 when they published a report *Real Patients Coming to Real Harm – Ophthalmology services in Wales*.[90] The report highlighted the problem of allocating too many *New* appointments in Ophthalmology clinics to the detriment of current clinic patients who were not receiving on-time treatment, resulting in probable vision loss. This is especially an issue for surgical outpatient clinics, when there is a constant flow of time-critical post-surgery appointments competing with longer-term (e.g. six-monthly) regular appointments. This report resulted in an all-Wales *Outpatient follow-up delay reporting data collection exercise* in 2015.[103] Subsequently, each Welsh health board is now required to submit a regular audit report each month detailing the number of patients overdue for an follow-up appointment, and by what percentage the appointment has been delayed based on the target date.[103] Opponents of this policy argue that if not managed correctly, the reported data is easily flawed. As with *New* wait lists, the overdue lists must be audited regularly

to maintain accuracy. If not, the list would contain patients who could not attend appointments due to health and personal reasons, patients who failed to attend appointments and patients who were told only to return if their symptoms worsened.[103]

2.2.14 Summary of outpatient data collection and maintenance

World-wide, surgical waiting times are given a higher priority over outpatient waiting times and therefore, the available outpatient data is inconsistently reported between countries. The statistics available in Australia vary from state to state and the states that do provide comprehensive waiting times (Victoria and Queensland) present and manage their outpatient wait lists differently. Monitoring the referral-to-treatment time is beneficial to those patients who are discharged back to community care at the end of their treatment. For those patients with specialist health needs who remain in the care of outpatient clinics e.g. some Ophthalmology patients, the importance of on-time follow-up appointments is also beginning to be realised. The importance of this study is that a system-wide approach was taken, which collects multiple metrics as measures of patient flow.

2.2.15 Conclusion

Healthcare redesign is a relatively recent field of research. There is a plethora of 'how-to' guides, but quality evidence of success is hard to find. This is based partly on the differing definitions of success and the methodology chosen to measure success. Success has been determined by a combination of; enhancing the patient experience (whilst improving staff satisfaction), improving health outcomes and reducing healthcare costs.[16] Randomised control trials were initially viewed as the 'gold standard' for measuring redesign success, but as this area of inquiry has expanded, the effect of context is now recognised as crucial for explaining and defining success. As context is not thoroughly investigated and the quality of studies is generally low in the outpatient literature, this study aimed to both quantify success and explore the barriers and enablers of a pilot staff-led clinical redesign program in two outpatient clinics in Australia.

3 Methods

This chapter discusses why a mixed methods approach to the research was taken and describes some of the controversies surrounding the definition (and evolution) of mixed methods research. The three distinct phases of this study are then explained, including how and when the qualitative and quantitative data were combined to answer the following primary and secondary research questions.

Q1. *Does the application of clinical redesign improve patient flow through Plastic Surgery and Ophthalmology Outpatient clinics?*

Patient flow was defined by the following measures:

- Percentage of patients who waited longer than the clinically recommended time before attending their first outpatient appointment by triage category
- Median wait time to the first appointment by triage category
- Did Not Attend (DNA) rate
- Discharge rate
- Hospital and patient appointment cancellation rates
- The number of overdue follow-up appointments

Q2. *What are the factors influencing the implementation and success of the redesign initiatives?*

3.1 Methodological approach

3.1.1 Mixed methods research

Mixed methods research combines elements of both qualitative and quantitative methods for the purposes of breadth and depth of understanding and corroboration in a single study. It has been proposed that mixed method research moves past the paradigm wars that sees quantitative and qualitative research as so philosophically different that the findings cannot be successfully integrated.[104] The post-positivist view, mostly associated with quantitative approaches, is based on the assumption of a singular reality and that the goal of research is to find the one 'correct' answer. This research process is usually conducted using a deductive or 'top' down approach, using data to test a hypothesis.[105, 106] This methodology is considered by some purists to be incompatible with the

constructivist approach, which views reality from multiple perspectives shaped by interaction with others and personal history. A constructivist approach uses an inductive or 'bottom up' approach.[106] A third paradigm is the participatory world view which is influenced by the need to improve society and encompasses such issues as empowerment and marginalisation with the aim of giving a voice to those experiencing those injustices. The fourth and final paradigm discussed by Creswell and Plano Clark is the pragmatic world view. This focusses on the primary importance of the research question (as opposed to the methods) and on the use of multiple methods of data collection to inform the issues being studied. Pragmatism is the paradigm typically associated with mixed methods research and even encourages the use of multiple paradigms in the one study.[106] This research approach negates the philosophical argument of being tied to a strict set of epistemological and ontological beliefs. By utilising pragmatism, the investigator is able to choose and employ multiple research approaches to understand the research question: induction (discovery of patterns); deduction (testing of theories);[104] and abduction (logical inference which starts with an observation).[107] Pragmatism contends that results have priority over the method and that different approaches can strengthen the outcome, that was generated from two different perspectives.[104] Mixed methods research is commonly used in health systems studies to explain the phenomena behind quantitative findings.[11] The two components must be complementary to ensure the whole is greater than the sum of the parts.[108] This form of research necessitates extensive planning, including the allowance of enough time for collection and analysis of the data.

Not all situations justify a mixed methods approach. Creswell and Plano Clark developed a list of research problems which best fit a mixed methods methodology.[106]

- Where one data source may be insufficient
- To explain initial results
- To generalise exploratory findings
- To enhance a study with a second method
- When a theoretical stance is required to provide a framework for the study
- To understand a research objective through multiple research phases.

Due to the complex nature of patient flow in outpatient clinics, this research required multiple data collection methods over an extended time period. Qualitative data was assembled over the study period by observing patient and staff activity during clinic sessions (both the clinical area and waiting room), during redesign meetings and through discussions with the project officers, staff and patients. This helped to create an accurate representation of how patients moved through the clinic system and the reasons why the staff focussed on each problem and chose the subsequent solutions. The examination of both the clinic attendance and wait list data sets were used to evaluate any changes to patient flow, whilst the exploration of the factors influencing the implementation and success of the redesign initiatives helped to avoid the 'black box' phenomena common in evaluations. The aptly named black box is the opaque space between the actual input and the expected output of a program.[109] Stame describes this problem when program designers do not thoroughly explore the finer details of an intervention, and evaluators make the same mistake when measuring outputs and automatically crediting the change to the input.[109]

There are numerous ways in which qualitative and quantitative phases can be combined in a mixed methods study, but two main design considerations are:

- the relative timing of the two components; and
- how the components are integrated.[11]

The overall research question should drive the study design and how the data will be integrated. If data integration is planned first, then the timing of the components follows naturally. This avoids the issues of retro-fitting data into a set typology.[11] Curry and Nunez-Smith contend that the relative weights of each component are not a defining feature of a mixed methods study, as the weights cannot always be determined in advance and are not a marker for the amount of resources invested.[11]

Mixed method study designs can be either fixed or emergent. In a fixed design, the use of qualitative and quantitative data is predetermined and planned from the beginning. Emergent designs usually occur when a second approach is added after the study has commenced because a single method was

found to be inadequate.[106] The mixed methods research methodology was first discussed in 1989, with continual and ongoing input from the social, behavioural and human sciences.[110] This research is an example of the evolving classifications to the typology-based approach of mixed method designs. The typology-based approach is concerned with how data is combined. Using Creswell & Plano Clark's (2011) typology-based definitions, in 2014-15 when this project was planned there were four main methods of data integration: convergent, sequential, embedding [11, 106, 111] or using a theoretical framework to combine two data sets[106]. The difference in the timing and analysis between the types is presented in Table 3-1.[106]

Table 3-1 Common types of mixed methods studies

Convergent parallel design	**Explanatory sequential design**	**Exploratory sequential design**	**Embedded (nested) design**	**Transformative design**
Concurrent quantitative and qualitative data collection Separate analysis of both data sets Merging of the two data sets	Phase 1: Quantitative data collection and analysis first (sequential) Phase 2: Qualitative data collection and analysis building on phase 1	Phase 1: Qualitative data collection and analysis first (sequential) Phase 2: Quantitative data collection and analysis building on phase 1	Either concurrent or sequential collection of supporting data, before, during or after the major data collection	Using a transforming theoretical framework to guide the concurrent or sequential data collection

From [106]

The embedded design was chosen for this study because the qualitative data was continually used to inform how the final quantitative analysis would occur. Similar studies which have used a concurrent embedded design (both data sets collected simultaneously) emphasise the supportive role that the qualitative data makes, whilst also being able to answer a separate question.[112, 113] In a similar design to this, participant comments and observational field notes were gathered to provide confirmation that the pilot tested instrument measured accurate client outcomes at a nursing centre.[114] The timing of the embedding of the secondary data set, which is usually qualitative, is not prescriptive and is reliant on the judgement of the researcher.[11, 106] Embedding can be performed before the primary data collection (to inform the development of the primary method), during the primary data collection e.g. interviews during a randomised control trial, or at the conclusion of the intervention.[11, 106]

In the most recent edition of *Designing and conducting mixed method research*, Creswell and Plano Clark (2018) simplified their description of mixed methods research studies into three core designs – convergent, explanatory sequential and exploratory sequential.[110] The authors explain the reason for the simplification is to help the researcher choose a core design as a framework to answer the research question. There is also a subtle change away from emphasising the timing of the integration (especially when both data sets are collected at the same time), to emphasising the intent of the design - that is, to explain, explore or converge the results for a better understanding of the study area.[110]

Creswell & Plano Clark in 2018 removed embedding as a mixed methods design because "we now see embedding as one of several possible ways that researchers may intersect the core mixed methods with another approach"…pg. 61[110] Even though the research plan for this thesis did not change, this study could now be described as a "fully integrated variant" of a convergent design because the qualitative and quantitative strands interacted with each other during the study, instead of being kept separate and independent until the analysis phase.[110] An embedded/convergent design using a pragmatic world view was chosen to answer the primary research question:

> *Does the application of clinical redesign improve patient flow through Plastic Surgery and Ophthalmology Outpatient clinics?*
>
> Patient flow was defined by the following measures:

- Percentage of patients who waited longer than the clinically recommended time before attending their first outpatient appointment by triage category
- Median wait time to the first appointment by triage category
- Did Not Attend (DNA) rate
- Discharge rate
- Hospital and patient appointment cancellation rates
- The number of overdue follow-up appointments

All the qualitative data (surveys, field notes, meeting minutes) from both outpatient clinics were then combined into one data set and thematically analysed to answer the secondary research question (also utilising a pragmatic world view):

What are the factors influencing the implementation and success of the redesign initiatives?

Figure 3.1 displays a flow chart of the data analysis steps to show that the qualitative data was embedded into the quantitative data to answer the primary research question. The qualitative data from the Plastic Surgery and Ophthalmology Outpatient clinics were combined and themed to answer the secondary research question.

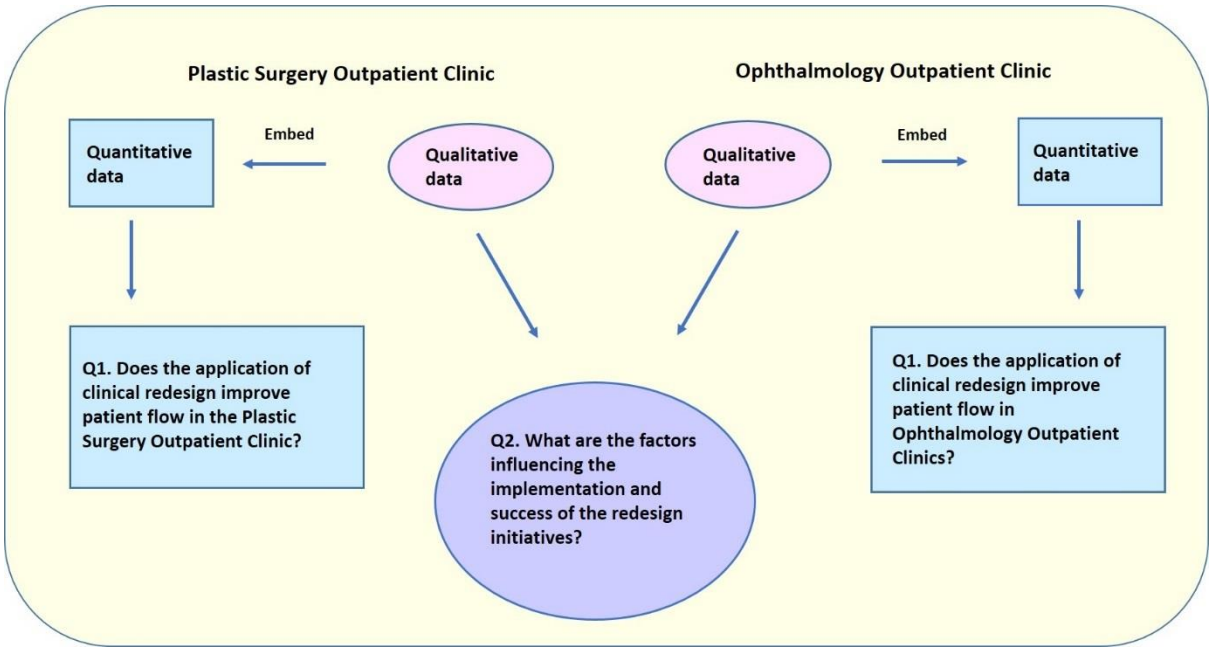


Figure 3.1 Data analysis using the fully integrated variant of a convergent design

As per the definition of embedding as defined by Fetter *et al.* the qualitative and quantitative data were brought together at multiple points for analysis and comparison in this study.[115] Also, as proposed by Creswell and Plano Clark, there are three data analysis questions to be answered when using an embedded design:[106]

1) How to use the secondary data set
2) When to incorporate the secondary data set into the primary data set
3) How the secondary data supports or augments the primary data

In this study, the qualitative data was used to answer a separate research question as well as to assist in the design of the quantitative analysis parameters (changes to patient flow) and verify the internal

validity and objectivity of the results. The qualitative data was also incorporated into the quantitative data analysis as a description of each problem, staff-led solution and analysis of each solution described in the quantitative results chapters (Chapter 5 and 6). The argument for choosing the embedded methodology is reinforced by the qualitative data having a key role in the quantitative evaluation of the changes to patient flow. The qualitative data provided an explanation for each of the changes in patient flow metrics (e.g. waiting time, DNA rate, hospital cancellation rate etc.). Qualitative data provided context to the quantitative results, allowing for a more thorough understanding of factors influencing the outcome of a program.

Not all researchers have such fixed views on the requirement to derive results from separate qualitative and quantitative components. Yin argues that the dichotomous view of qualitative and quantitative data being separate entities hides the reality that there can be many different mixes or combination of methods.[116] As shown by the ever-changing typology of mixed methods research, more researchers are arguing that separating the two types of data until designated points in the study may hinder a truly integrated analysis.[117, 118] There is even a suggestion that two types of either qualitative or quantitative data alone can represent mixed methods research e.g. an experiment plus surveys in a single study is an example of mixed methods research without any qualitative data collection.[116]

3.1.2 Assessing mixed methods quality

Regardless of the methods used for data mixing, the same rigorous standards of data collection apply as they do in single method studies. Curry and Nunez-Smith created a common standards chart (Table 3-2) which aids in the appraisal of mixed methods studies. [11] The aim was to unite the sometimes contrasting views of qualitative and quantitative researchers. The authors appealed for improved transparency and completeness of results in manuscripts so that reviewers can adequately assess the quality of the research. These standards of appraisal can be applied to both qualitative and quantitative research, regardless of whether they are integrated into one study.

Table 3-2 Common standards of appraisal criteria for qualitative and quantitative studies

Standard	Qualitative appraisal criteria	Quantitative appraisal criteria
Veracity	Credibility- degree to which the findings plausibly explain the phenomenon of interest	Internal validity – the degree to which the findings represent a true reflection of a causal relationship between the variable of interest
Consistency	Dependability – the degree to which the researchers account for and describe the changing contexts and circumstances	Reliability – the degree to which results can be replicated
Applicability	Transferability – the degree to which the findings can be transferred to other settings	External validity – the degree in which the study results hold true for a population beyond the participants
Neutrality	Confirmability – the degree to which the findings of a study are shaped by respondents and not researcher bias	Objectivity – the degree to which the research reflects the true nature of what was studied

From[11] pg. 174

Despite the combination of research techniques chosen, the advantages of having two methods which each address issues that the other cannot, will be negated if the data is not successfully integrated. The result will be essentially two independent, but possibly complementary studies.[11, 116]

3.2 Research phases

This study was emergent in design, with three interconnecting phases;

Phase 1: Understanding and refinement of study area (December 2014 - March 2015)

Phase 2: Intervention period (April 2015 - June 2016)

Phase 3: Analysis phase (July 2016 - July 2018)

3.2.1 Background

When my candidature commenced in early December 2014, the Intervention phase was already planned to begin on April 1st, 2015 (immediately following the completion of the two-day clinical redesign workshop). Five outpatient clinics were recruited by a clinical lead physician to participate in the 2-day workshop and undergo a 6-month program of clinical redesign, ending in September 2015. A further five clinics were enrolled in another 2-day workshop to start in October 2015 and participate in a further round of clinical redesign activities ending in March 2016.

The original research plan was to compare and contrast the results from the first five clinics who participated in the redesign program and to monitor the sustainability of the changes until October 2016 (Figure 3.2).

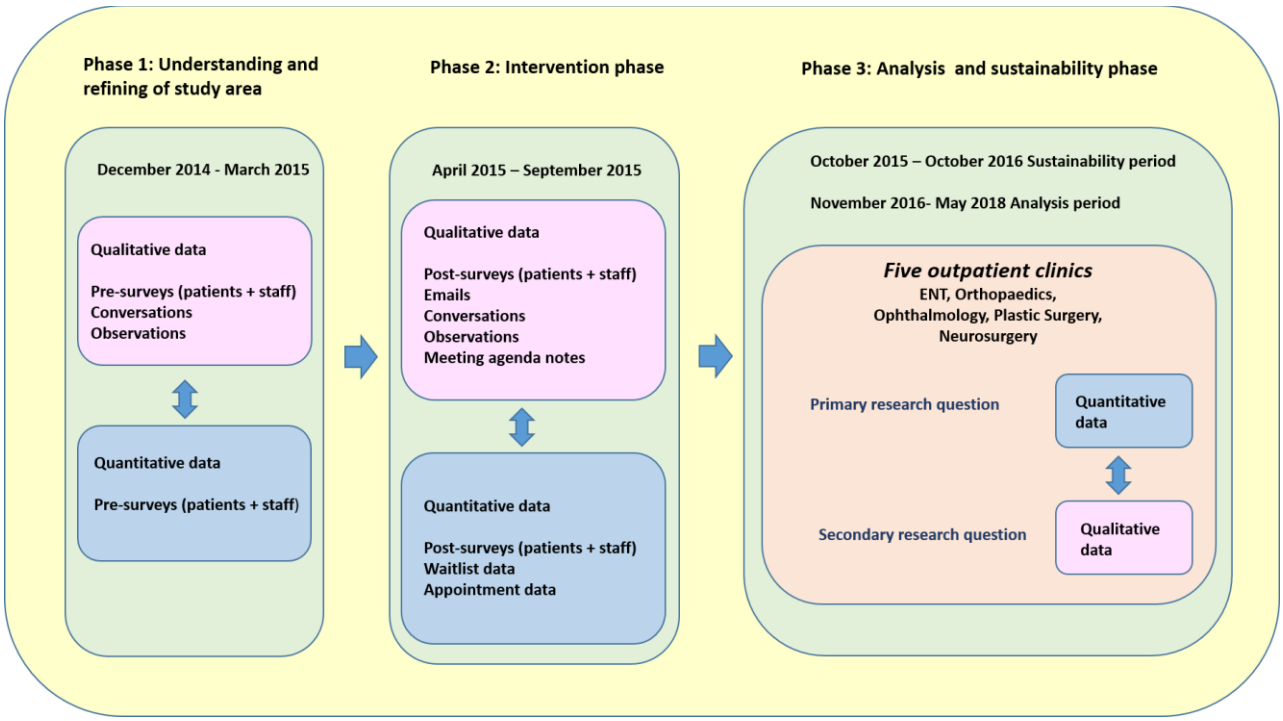


Figure 3.2 Original research plan

Part of the evaluation included both staff and patient surveys before and after the interventions. However, several events took place that led to changes to the original research plan.

- One week prior to the 2-day workshop, the Orthopaedic clinic withdrew from the program citing staffing reasons.
- Despite previous support and ethics approval, all HSI-sponsored staff surveys were disallowed with a change of hospital executive.
- The second group of clinics began the redesign program in October 2015, but the first group of clinics did not cease participation after six months as scheduled. All four original clinics continued their interventions until March 2016, which was then extended to June 2016 with additional funding. The Intervention phase was expanded to 15 months, with no time available to analyse the ongoing sustainability of the program.
- After all the patient surveys were distributed and after the 2-day workshop, it was decided that this research would focus on the evaluation of the redesign activities of the two largest

clinics – Plastic Surgery and Ophthalmology, for logistical reasons. This decision was solely made for logistical reasons. Each clinic Working Group held separate meetings and commenced tailored redesign programs and the research team felt there was not enough time and opportunity to be completely involved in four redesign Working Groups. The final research plan is depicted in Figure 3.3, and the three phases will be described in detail in the following section.

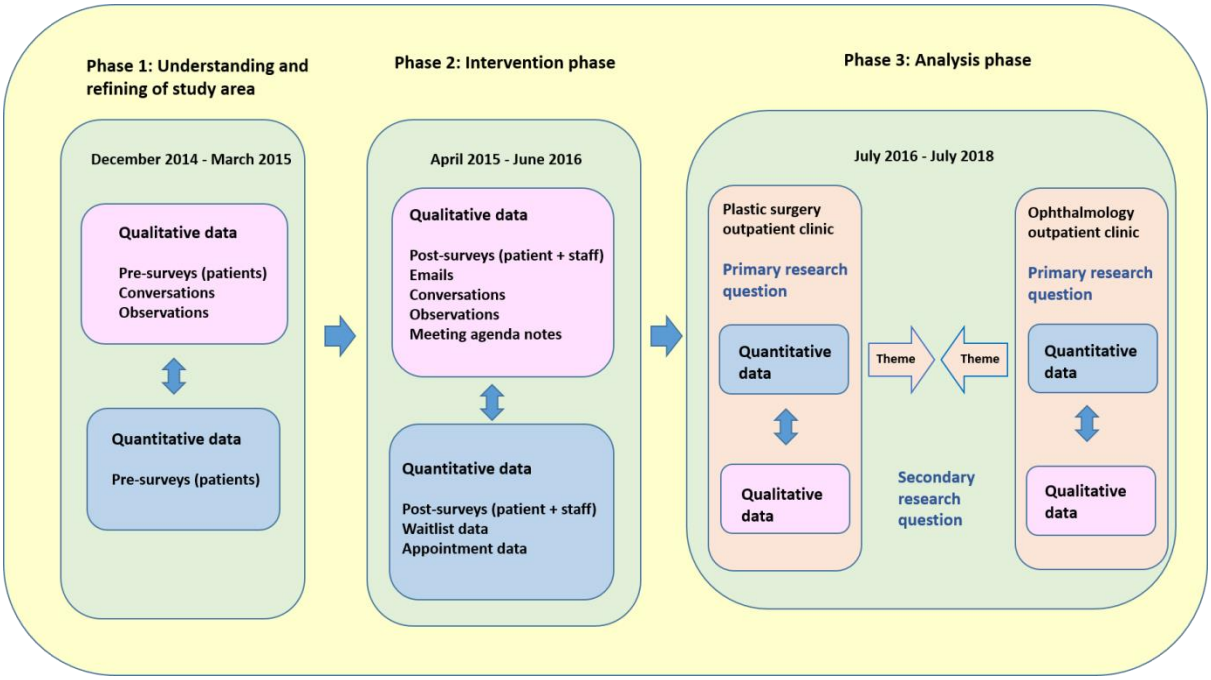


Figure 3.3 Final research plan

3.2.2 Phase 1: Understanding and refining study area

The main research priorities during Phase 1 were to gain ethics approval for the study (for staff and patient surveys, and the collection and analysis of both the appointment and wait list data sets) and to perform the Pre-intervention patient and staff surveys. The specific aim of the patient survey was to replicate and explore the factors behind an earlier internal survey across all the RHH outpatient clinics in the Wellington Centre (not undertaken by the researcher). This survey found that 19% of the 104 patients surveyed, rated their overall clinic experience as 5 or below out of 10 using a Likert scale. The patient-identified problems included booking mix-ups, appointments being cancelled without notifying patients and appointment allocation to patients at too short notice.

Ethics approval for the patient surveys was not obtained until one week prior the 2-day workshop, and an intense week of surveying patients took place during the week of the 23rd-27th of March 2015. Orthopaedic patient surveys had already commenced when the clinic ceased participation in the program. The two-day clinical redesign workshop took place on the 29th-30th March 2015; during these 2 days staff were introduced to the Lean practises of standardised work processes and the reduction of waste. The outcome of the workshop was a list of problems developed by each clinic and the formation of Working Groups to implement the solutions formulated.

A comprehensive methods table of Phase 1, detailing the data collection tools, sampling method and analysis is presented in Table 3-3.

Table 3-3 Phase 1 methods table

Phase 1: Refinement of study area (Dec 2014-March 2015)			
Activity	**Data Collection Tools**	**Sampling**	**Analysis**
Quantitative and Qualitative: Patient satisfaction surveys	NHS (England) Outpatient Satisfaction Question Bank Tool (Picker Institute)	Opportunistic sampling of patients in waiting room (ophthalmology, ENT, neurosurgery, plastic surgery and orthopaedic surgery).	Only Ophthalmology and Plastic surgery included in analysis. Descriptive statistics and thematic analysis. Integrated into phase 2 and 3 data.
Quantitative and Qualitative Staff satisfaction surveys	NHS (England) Staff Satisfaction Question Bank Tool (Picker Institute)	All clinic staff in 5 clinics, ethics approval granted but all surveys in the hospital-wide redesign program not permitted by the hospital executive.	NIL
Qualitative Observation in waiting rooms and work areas during clinic sessions	Field notes – description of patient flow during clinic sessions, management of referrals, staff roles before during and after each clinic session	All five outpatient clinics	Integrated into phase 2 and 3 data.
Qualitative Observer in 2-day redesign workshop	• Agenda from workshop. • Field notes taken during sessions with each outpatient clinic. • Action plan document developed by staff at completion of workshop.	Four outpatient clinics (one clinic declined participation)	Integrated into phase 2 and 3 data

3.2.3 Data collection tools

3.2.3.1 Patient satisfaction survey

A twenty-one-question patient survey was compiled from the Outpatient National Health Service (NHS England) survey tool.[119] This was a tailored survey specifically for the outpatient setting devised by the Picker Institute. The Picker Institute co-ordinates NHS patient survey programs in England. The Picker Institute is one of the approved and accredited suppliers of PROMS (Patient Reported Outcome Measures). The purpose of the PROMS is to collect data regarding the quality of care received from the patient perspective.[120] The NHS Survey website provides a survey compilation tool, including a survey question bank, as a resource for other health organisations to use.

The patients from all five outpatient clinics received the same survey and were surveyed over two clinic sessions in the week of the 23rd - 27th March 2015. The patient survey, consent form and information sheet are in Appendix (i), (ii) and (iii). A day prior to each survey session the clinical redesign project officer supplied the researcher with a list of clinic patients, along with the unique patient identifiers and appointment times. Patients were invited to participate whilst in the waiting room. Ethics was granted to obtain demographic data from each patient consenting to the survey (Appendix (iv)). An attempt was made to recruit all patients in each clinic session. This proved difficult as not all patients presented for their appointments and some waiting rooms were shared with non-participating-clinic patients. The subjects were invited to complete the survey at the end of their clinic consultation or return the completed survey by mail in a pre-paid envelope. As an incentive to return the survey, one patient per clinic (who completed and returned the survey) was randomly selected to win a $50 shopping voucher. The de-identified data was manually entered onto a Microsoft Excel™ spreadsheet for analysis and the free-text section was transcribed into a Microsoft Word™ document.

3.2.3.2 Staff survey (original)

A twenty-one-item staff survey was compiled from the Staff NHS Survey Tool 2014.[121] Although the survey tool was not used it is included in Appendix (v) for completeness.

3.2.3.3 Redesign workshop

As the aim of this study was to determine if this unique design of a staff-led, Lean-inspired clinical redesign program resulted in an improvement in patient flow, the specific details of the redesign workshop is included as part of the Method. The workshop provided the staff with the capacity to participate in the change management process by providing education to empower them to take ownership of the initiatives. The two-day intensive workshop (based on the Kaizen blitz format) was held on the 29th-30th March 2015 (full program agenda in Appendix (vi)). Clinic staff were trained in the Lean concepts of flow and waste and Table 3-4 is a summary of the Lean concepts, tools and

techniques covered. The aim of the workshop was to identify work-flow issues that could benefit from Lean-inspired interventions.

Table 3-4 Lean concepts taught in the 2-day clinical redesign workshop (summary of educational material presented)

Lean Concepts	Tools and Techniques
Flow – is reducing the amount of time that any product/ patient is sitting idle, waiting for someone to work on it. Flow improvement comes from eliminating waiting, interruptions and delays **Waste – any activity that consumes resources but creates no value for the patient** *Muri*: *overburden* e.g. staff double shifts *Mura*: *unevenness in production* e.g. not planning for public holidays *Muda*: *Defects* e.g. work that must be re-done due to errors *Overprocessing* e.g. placing information in multiple IT systems *Waiting* e.g. time lost when equipment underutilised *Non-utilised people* e.g. staff whose skills are not aligned with their work *Transportation* e.g. placing multiple calls to transport a patient *Inventory* e.g. too many temporary storage areas *Motion* e.g. searching for equipment *Extra-production:* discarding out-of-date food	**Visual Management Definition:** Simple, clear and concise visible indications/mechanism, which show ***"at a glance"*** the status of a machine, a resource, and an entire working area with a plan or definable objective e.g. clinicians not knowing who to ask to locate a piece of equipment **Standard Work definition:** ***Standard work is the best sequence of process steps to achieving the outcome.*** • Is visible, at point of use and understood by all • Shows how the process works • Shows where you are up to • Shows where you should be up to • Shows what to do if there is a problem

As part of the workshop, the multidisciplinary staff from each clinic were tasked with creating a Big Picture Map. A Big Picture Map is a Lean tool to describe the movement of a patient through a value stream.[23] The value stream in this exercise was patient flow through each clinic including all the steps from receipt of the referral through to the outcome of the appointment. The value stream was divided into the headings of referral, triage, booking an appointment, wait list management, day of clinic and outcome of appointment.

Using a facilitator and a set of pre-determined questions (Table 3-5) the Big Picture Map was developed in two phases – a current state map (describing current processes) and a future state map (describing the ideal processes). This was a manual task achieved by using a large sheet of paper with the value stream steps as headings and 'sticky notes' of two colours – one for the current state map and another for the future state map. The staff members first recorded how each value stream step was currently managed on the yellow notes, and then how the value stream step should occur in an ideal situation (pink notes) and placed them under the corresponding value stream heading (Figure 3.4). The clinical redesign project officer and the redesign consultant collated the information contained in Big Picture Map for each clinic. The identified problems became the basis for the agenda items which were discussed at the first clinical redesign Working Group meetings which began in April 2015. The unedited Big Picture Map (as produced by the staff and shown in Figure 3.4) became part of the qualitative data set for each clinic.

Figure 3.4 Staff participating in a Big Picture Mapping session

Table 3-5 Big Picture Map template for facilitators

	Referral	Triage	Waitlist	Booking appointments	Day of clinic	Outcome of appointment
Patient	Who can refer? GP? ED? Inpatient? Child health nurse? Self?	Does patient know triage category?		How is the patient notified? Telephone? mail? How are last minute appointments allocated?	Issues on arrival? Do you know your clinic DNA rate? Is there a DNA policy?	Can patient return without another referral?
Process	Is there a standard referral form? Electronic? Paper?	Who can triage? Are there triage guidelines? 'Red flag' guidelines for emergencies?	How many wait lists? Dr specific? Regular audits? What happens to urgent referrals?	Who does this? Set number of Cat 1/2/3 appointment slots? Is overbooking allowed? Time allocation for new and review appts. the same? Public holidays?	Does clinic start and finish on time? Equipment issues? Is paperwork completed same day? New staff orientation guidelines?	Who can discharge? Guidelines for registrars? How far to book in advance?
Clerk	What do you do with the referral?	What stage is referral entered on system?		Clerk or nurse? How are last minute cancellations managed?	DNA paperwork?	
Communication back to GP	How, when, what?	How and when does GP find out?		GP notified?	GP notified of DNAs?	How does GP find out and how long does it take?

3.2.4 Phase 2: Intervention phase

The main research goal during the Intervention phase was to assemble in detail as much information from multiple sources regarding the interventions that were both planned and implemented. Data was gathered by attending all the redesign Working Group meetings and collating the minutes from each meeting (including the annotations made by the researcher at these meetings). Additional time each fortnight was spent with the project officer and project support officer discussing the progress of the initiatives, which was entered into the researcher's diary (approximately one hour per fortnight). Time was also spent with the HSI data analysts examining the sample raw data provided by the RHH and relaying questions and information between the data analysts and Working Groups. The activities that the researcher was involved with during this Intervention period were identical for both Plastic Surgery and Ophthalmology clinics, except for a patient tracking exercise and the *What drives me crazy at work?* diagnostic activity, both with the Ophthalmology clinic (Ethics amendment for qualitative data collection in Appendix (vii)).

After a change of hospital executive, permission was granted for the post intervention staff surveys. As there was not a baseline survey for comparison, the new questions were based on staff perception of the changes as a result of the redesign program. The survey format was identical to the surveys employed in another HSI clinical redesign project (medical wards in the RHH). An ethics amendment was required for the new staff surveys. The methods table for the Intervention period is shown in Table 3-6.

Table 3-6 Phase 2 methods table

Phase 2: Intervention Phase (April 2015-June 2016)				
Activity	**Data Collection Tools**	**Clinic**	**Sampling**	**Analysis**
Quantitative and Qualitative: Patient surveys	NHS (England) Outpatient Satisfaction Question Bank Tool (Picker Institute)	Plastic Surgery	Opportunistic sampling of patients in waiting room. April 2016	Descriptive statistics and thematic analysis
Quantitative Patient tracking	Developed a patient tracking tool for monitoring patient activity during clinic sessions	Ophthalmology	General eye clinic and eye injection clinic. October 2015	Descriptive statistics
Quantitative Data analysis	Investigate 2 x Excel™ spreadsheet in preparation for data analysis in July 2016	Plastic surgery and Ophthalmology	Wait list and appointment data from Jan 2014 - Dec 2014 (trial)	Descriptive statistics (trial)
Quantitative and Qualitative: Staff survey	Staff clinical redesign survey	Plastic surgery and Ophthalmology	Plastic Surgery staff (April 2016) Ophthalmology staff (June 2016)	Descriptive statistics and thematic analysis
Qualitative Observation in work areas during clinic sessions	Field notes – description of patient flow during clinic sessions, management of referrals, staff roles before during and after each clinic session.	Plastic surgery and Ophthalmology	April 2015-June 2016	Integrated into quantitative data for thematic analysis
Qualitative Observer in clinical redesign workgroups	Annotated (by researcher) minutes of each Working Group meeting. *	Plastic surgery and Ophthalmology	April 2015-June 2016	Integrated into quantitative data for thematic analysis
Qualitative "What drives me crazy at work" diagnostic activity	Anonymous staff comments written on an A0 sheet of paper in the staff lunch room over 1 week in May 2015.	Ophthalmology staff	May 2015	Integrated into quantitative data for thematic analysis

* The researcher kept a separate diary of the progress of all the initiatives of both Working Groups which was updated after each meeting or if additional information about the initiatives was obtained during interactions with the clinic staff.

3.2.5 Data collection tools

3.2.5.1 Patient satisfaction survey

The original purpose of the patient satisfaction survey was to inform the work of the project e.g. was there any area of patient care that could be improved as a result of the clinical redesign program? The same 21-item patient satisfaction survey, as used in Phase 1, was repeated in April 2016 in the Plastic Surgery Outpatient clinic waiting room. The survey was not repeated for the Ophthalmology patients as only one clinic session was sampled Pre-study (the other session was cancelled due to physician

illness) and the 28 surveys (60% return rate) showed great satisfaction with the clinical service provided by the clinic. Additionally, the Ophthalmology clinic had not completed their redesign program by the end of the data collection period (only half of the activities had been completed). It was not seen as a priority for the staff and overburdened program officers to conduct a patient satisfaction survey at this time. The Ophthalmology Pre-survey results are provided in Appendix (viii).

Informal feedback to the researcher whilst conducting the patient surveys revealed a dissatisfaction with the amount of time spent waiting in the Monday morning general Ophthalmology clinic. This resulted in a patient tracking exercise to further explore the problem.

3.2.5.2 Patient tracking (Ophthalmology)

The Working Group requested a measurement of the time patients spent waiting during a clinic session on the Monday morning general clinic.

The following section outlines the typical patient trajectory in the ophthalmology outpatient clinic:

> On arrival in the clinic, patients were directed by the booking clerks to the waiting room where they remained until called by a nurse into a consultation room for a visual acuity test. Many patients were given mydriatic (dilating) eye drops during this time in preparation for further tests. As the drops took 20 minutes to fully dilate the pupil, the patient then returned to the waiting room. A nurse/orthoptist/ optometrist/physician would then lead the patients to one of 13 rooms to undergo a test/procedure, with the patient returning to the waiting room after each test. Patients were known to remain for up to three hours during one appointment. The Working Group wanted to find out if there was a room or staff member which was causing a bottle-neck in patients' movements around the clinic.

After completing a literature search, the only patient tracking methods published were real-time location systems (electronic devices worn by staff and patients),[122] and manual tracking method (a Lean tool requiring researchers to manually document all patient and/or staff movement during a

clinic session). [19] As resources were not available for either of these activities, a new method was developed. A simple A4 tracking form was developed which each patient carried around with them during their appointment (Figure 3.5).

Patient tracking in Ophthalmology Clinic: This study is designed to see which tests are the most frequently performed, by whom and in which room. The results may help to redesign the flow of patients in clinic.

Instructions for health professionals: Please fill in the time when the patient arrives into your room. When the consult is finished, please circle the room, your role, which activities were performed in that room and the time the consult finished and put your initials in the box.

Please hand this form back to the patient at the end of their consult. **PT #**

Time in?	Room?					Who?		Which activity?				Time out?	Initials
	i1	i2	i3	i4	O	RN	Consultant	Acuity	Drops	Auto ref	A Scan		
	V1	V2	L	OCT (L)		Reg	Orthop	Fluoro	Lens Meter	Ret photo	HESS		
	i	F	(iP)Treatment		A	Optom		Vis Field	CC thickness	OCT	IOP		
								Colour vision	Consult	Angio	Injection		

Time in?	Room?					Who?		Which activity?				Time out?	Initials
	i1	i2	i3	i4	O	RN	Consultant	Acuity	Drops	Auto ref	A Scan		
	V1	V2	L	OCT (L)		Reg	Orthop	Fluoro	Lens Meter	Ret photo	HESS		
	i	F	(iP)Treatment		A	Optom		Vis Field	CC thickness	OCT	IOP		
								Colour vision	Consult	Angio	Injection		

Time in?	Room?					Who?		Which activity?				Time out?	Initials
	i1	i2	i3	i4	O	RN	Consultant	Acuity	Drops	Auto ref	A Scan		
	V1	V2	L	OCT (L)		Reg	Orthop	Fluoro	Lens Meter	Ret photo	HESS		
	i	F	(iP)Treatment		A	Optom		Vis Field	CC thickness	OCT	IOP		
								Colour vision	Consult	Angio	Injection		

Time in?	Room?					Who?		Which activity?				Time out?	Initials
	i1	i2	i3	i4	O	RN	Consultant	Acuity	Drops	Auto ref	A Scan		
	V1	V2	L	OCT (L)		Reg	Orthop	Fluoro	Lens Meter	Ret photo	HESS		
	i	F	(iP)Treatment		A	Optom		Vis Field	CC thickness	OCT	IOP		
								Colour vision	Consult	Angio	Injection		

Time in?	Room?					Who?		Which activity?				Time out?	Initials
	i1	i2	i3	i4	O	RN	Consultant	Acuity	Drops	Auto ref	A Scan		
	V1	V2	L	OCT (L)		Reg	Orthop	Fluoro	Lens Meter	Ret photo	HESS		
	i	F	(iP)Treatment		A	Optom		Vis Field	CC thickness	OCT	IOP		
								Colour vision	Consult	Angio	Injection		

Figure 3.5 General Ophthalmology clinic patient tracking form

3.2.5.3 Patient tracking method

On the day prior to the tracking session, the appointment clerk supplied the researcher with a list containing names and appointment times for all the patients. The researcher then allocated each patient on the list a consecutive patient number (identifier) according to their appointment time. As each patient entered the waiting room for the first time they were approached and invited to participate in the exercise.

A tracking form (coloured bright pink for easy identification) containing the unique identifier was handed to each patient. The form was carried by the patient during their entire appointment and handed back to the researcher before departing the clinic. On entering each consultation room, the patient handed the eye health professional the pre-populated form. The health professional wrote the time of patient entry into the room, and at the completion of the consultation, circled the corresponding room number, their job title, the tests/procedures undertaken and the time the patient left the room. Written patient consent was not required as the patients' medical records were not accessed. The times were manually entered into an Excel™ spreadsheet and the data was transferred into the software program R™ and graphed by one of the supervisors (JS). This tracking form was redesigned to accommodate the procedures undertaken in an intraocular injection clinic, and patients in this clinic participated in an identical tracking exercise in March 2016 and the results were compared.

3.2.5.4 Staff survey (updated)

The original role of the staff surveys was to monitor any change in staff satisfaction of their working environment as a result of the redesign program and to inform the work of the project. As the initial surveys were not permitted by the hospital administration (despite ethics approval), new post-intervention surveys were developed to measure the staff perception of the initiatives (both Plastic Surgery and Ophthalmology clinics). The qualitative and quantitative data for the surveys were embedded into Chapter 5 and 6, and the qualitative results were part of the data set used to answer the second research question:

What are the factors influencing the implementation and success of the redesign initiatives?

The ethics amendment, the two staff surveys and two information sheets are displayed in Appendix (ix), (x), (xi), (xii) and (xiii). The format was based on the staff surveys used in another HSI-redesign project on the medical wards at the RHH. The surveys were paper-based, and copies were placed into staff pigeonholes and in the staff tea-room (in Ophthalmology) and in the common work area in Plastic Surgery clinic. The staff returned the surveys to a designated box in each clinic on completion. As an incentive, a chocolate bar was provided to all staff who completed the survey. The results from the quantitative sections of the surveys were manually entered into a Microsoft Excel™ spreadsheet, whilst the free-text section answers were transcribed to a Microsoft Word™ document.

3.2.5.5 What drives me crazy at work? (Ophthalmology staff)

Ophthalmology staff members requested a further mechanism to comment on clinic issues and feedback suggestions to the Working Group. For two weeks during May 2015, a 1-metre sheet of white paper was placed on the staff tea room wall on which staff could add their comments under the headings of "*What drives me crazy at work*" and "*Bright ideas to improve systems and processes and flow*". The information was transcribed into a Microsoft Word™ document. This data was shared with the clinical redesign project officer to aid in the planning of the interventions and was used to educate

the researcher regarding the issues expressed by the staff. This data was also incorporated into the researcher field notes.

3.2.6 Phase 3: Evaluation and analysis phase

Data collection ceased at the end of June 2016 (even though both clinics continued with the redesign initiatives without official HSI sponsorship), and the evaluation phase began in July 2016 as described in Table 3-7.

Table 3-7 Phase 3 methods table

Phase 3: Evaluation and Analysis Phase (July 2016-July 2018)				
Activity	**Data Collection Tools**	**Clinic**	**Sampling dates**	**Analysis**
Quantitative: Outpatient wait list data	iPM extraction of Excel™ spreadsheet	Plastic surgery and Ophthalmology	Pre-study: Jan 2014 – March 2015 Intervention: April 2015 - June 2016 Extra data was requested for the year 2013	Descriptive and inferential statistics
Quantitative: Outpatient attendance data	iPM extraction of Excel™ spreadsheet	Plastic surgery and Ophthalmology	Pre-study: Jan 2014 – March 2015 Intervention: April 2015-June 2016	Descriptive and inferential statistics
Qualitative	All previous qualitative data from Phases 1 and 2 (including the researchers diary from Phase 2)	Plastic surgery and Ophthalmology	Pre-study: Jan 2014 – March 2015 Intervention: April 2015-June 2016	Thematic analysis

3.2.6.1 Quantitative data extraction

All outpatient appointment bookings, clinic attendances, and wait list data were entered in and stored in the iPM patient management system™ (DXC technology, Macquarie Park, Australia). Two Microsoft Excel® (Microsoft Corporation, Redmond, USA) spreadsheet extracts of this data were supplied to the HSI data analyst – one containing wait list data and the second comprising clinic attendance records. Both data sets were from the period 01/01/2014 to 30/06/2016. During the analysis period, an additional wait list data set was requested from the period 01/01/2013-31/12/2013.

The only common information available to link patients in both data sets were the unique patient identifier (PASID), the patients' date of birth (DOB) and the patients' title (Mrs/Mr etc.). The fields used in the analysis of the wait list and appointment data are as listed below.

Wait list data:

- PASID (unique patient identifier)
- Patient title (Miss/Ms/Mrs/Dr/Master/Rev)
- DOB
- Referral source
- Postcode of patient
- Date added to wait list
- Date removed from wait list
- Days waiting on wait list
- Urgency (triage) category
- Reason for removal from wait list (e.g. attended appointment*, appointment no longer required etc.)

**The wait list data did not identify the clinic where the patient attended their first appointment (The clinic code was only available in the Appointment data set)*

Appointment data:

- PASID
- Patient title
- DOB
- Type of appointment – *New*, *Review*, *Emergency, Walk-in, Telephone*
- Date of appointment
- Time of appointment
- Clinician
- Date when each appointment was rescheduled or cancelled (if applicable)
- Cancelled by (if applicable)
- Cancelled reason (if applicable)
- Clinic code (this unique code was specific to each clinic type, and clinician) e.g. nurse-led clinic, registrar hand clinic.
- Attend status of appointment e.g. *Attended, Cancelled, Did Not Attend*

- Outcome of appointment – e.g. another appointment required, patient discharged, request for admission

The full Appointment and Wait list data extraction fields are listed in Appendix (xiv) and (xv).

3.2.6.2 Quantitative data analysis

All descriptive and inferential statistical analysis were conducted using Microsoft Excel 2016 (Microsoft Corporation, Redmond, USA), except for the Ophthalmology 'patient tracking' graphs and the wait list graphs which were conducted in R (R Core Team (2013). R Foundation for Statistical Computing, Vienna, Austria)) and the Mann-Whitney U test which were conducted using StatView 5.0.1, 1998 (SAS Institute Inc, North Carolina, USA).

As an evaluation of the changes to patient flow, the following measures were calculated for each outpatient clinic and a comparison was made between the pre-study and intervention periods.

- Percentage of patients who waited longer than the clinically recommended time before attending their first outpatient appointment by triage category
- Median wait time to the first appointment by triage category
- Did Not Attend (DNA) rate
- Discharge rates
- The number of overdue follow-up appointments

3.2.6.3 Qualitative data analysis

Thematic analysis (TA) was the chosen qualitative analytic method. Thematic analysis is a method of identifying, analysing and reporting patterns in a data set. [123] One of the strengths of TA is that it permits theoretical freedom and does not stem from a theoretical or epistemological position.[123] TA "allows the researcher to determine precisely the relationships between concepts and compare them"[124] Another strength of this method is that the data can be collected in different situations at different times during the project, allowing for flexibility and responsivity to the situation.[124] TA permits data to be analysed in either a deductive or an inductive manner. An inductive or "bottom up" approach implies that the data is coded without trying to fit into a pre-existing coding framework.

Conversely, when a deductive (top down) analysis is undertaken, the investigation is driven by the researcher's theoretical or analytical interest.[123]

Another advantage of TA is that it allows the data to be collected by various means (field notes, surveys, meeting notes). Once collated, the data is read and re-read for the purposes of identifying, analysing and reporting patterns.[123] Data reduction is the important strategy in collating the data and eventually drawing conclusions. This is the final process of selecting, simplifying and transforming the data in a way that conclusions are prepared and verifications are completed.[124]

TA was selected because it is a very flexible method of analysis as one data set can be analysed in various ways. The entire data set can be examined, or one aspect of the data can be analysed in detail according to the research question.[123] The method of data analysis in this study was a combination of deductive and inductive approaches. The inductive approach was to code from the data and the deductive approach was a prior decision to examine the facilitators and barriers associated with the implementation of the redesign initiatives to answer the second research question:

What are the factors influencing the implementation and success of the redesign initiatives?

The procedure for conducting TA was based on the phases used by Braun and Clarke:[125]

Phase 1: Familiarising yourself with the data
Phase 2: Generating initial codes
Phase 3: Searching for themes
Phase 4: Reviewing potential themes
Phase 5: Defining and naming themes
Phase 6: Producing the report

Two days prior to each redesign meeting the project officer circulated a meeting agenda to both redesign Working Groups. These agendas contained an updated status of the progression of all the staff-led solutions (including those deemed to be completed and those not yet commenced). During each meeting, the researcher annotated the agenda and a 'clinical redesign meeting summary data

template' was constructed for both clinics (Table 3-8). The data in the two documents were continually reviewed at the conclusion of each Working Group meeting. At the end of the data collection period (30th June 2016), the researcher's diary and the staff survey results were examined for additional data relating to each staff-led solution and added to the templates.

Table 3-8 Clinical redesign meeting summary data template

Problem	Date problem identified	Staff-led solution	Outcome (as per agenda notes)	Completed as at 30th June 2016?	Extra notes from diary or staff survey

The information from the two data templates were combined into one document, containing all 52 planned initiatives from both clinics. After inspecting the data, it was decided to divide this document into two data sets - one consisting of the staff-led solutions which were marked as 'completed' by the 30th of June 2016 (as per the redesign Working Group agenda notes and documented in Table 3-8) and the other data set consisting of those marked as 'incomplete'. The data set marked as 'incomplete', was then separated into three categories:

- not completed;
- not started; and
- not permitted.

The four data sets (completed, not completed, not started and not permitted) were read and re-read for factors affecting the implementation and success of each staff-led solution. The code generating phase of the analysis was the next step. The data set was coded manually, with descriptive codes assigned to each issue, often assigning multiple codes to the same segment. The codes were then collated alongside a summary of each staff-led solution.

The next phase, as per Meade *et. al.*,[126] warranted a refinement of the codes. The codes were all written down on a piece of paper and sorted into 'theme-piles'. This process was not linear, as the original source of the data was continually checked, and the codes were constantly re-worked. A miscellaneous theme pile was permitted, [127] but after two iterations and discussions with the

supervisors, the miscellaneous theme was integrated into other themes. To aid understanding of the themes (and to ensure there was no overlapping of themes), a mind map of the themes was drawn. Using this mind map, major and sub themes were discussed with the supervisors and a consensus reached before a final thematic map was agreed. The original surveys and researcher's diary were continually consulted, and examples of each code were included in the final version of the thematic map to ensure the data was not duplicated into more than one code.

The quantitative results for each clinic are presented separately in Chapters 5 and 6. Since thematic analysis is used to answer the secondary research question, the qualitative results are presented following quantitative results – in Chapter 7. As embedding was the chosen method of combining the data, a description (and analysis) of each major staff-led intervention and the results of the staff survey are included as part of the evaluation of the change to patient flow. At the end of both Chapters 5 and 6 is a summary of all the patient flow changes and a final appraisal of the main objective of the evaluation as stated by the research question:

> *Does the application of clinical redesign improve patient flow through Plastic Surgery and Ophthalmology Outpatient clinics?*
>
> Patient flow was defined by the following measures:

- Percentage of patients who waited longer than the clinically recommended time before attending their first outpatient appointment by triage category
- Median wait time to the first appointment by triage category
- Did Not Attend (DNA) rate
- Discharge rate
- Hospital and patient appointment cancellation rates
- The number of overdue follow-up appointments

The next chapter (Chapter 4) presents contextual information describing the operational activities common to both Plastic Surgery and Ophthalmology Outpatient clinics. These findings provide additional background material for Chapters 5 and 6.

4 Results: Contextual information common to Plastic Surgery and Ophthalmology clinics

This chapter presents and synthesises data collected from observations during clinic sessions (both in the staff work area and waiting room), patient and staff surveys and the agenda items from the clinical redesign meetings (*Plastic Surgery Clinical Redesign Working Group* and *the Ophthalmology Clinical Redesign Working Group).* This information provides context to Chapters 5 and 6. The clinics shared the same nurse unit manager and the administrative processes were very similar. This chapter explains patient movement through the clinic system, including how patients obtained an appointment, the appointment classification system and the process by which HSI provided data to each Working Group.

4.1 Patient flow

Before evaluating the redesign program, a thorough investigation of patient movement through the outpatient clinic systems was required. Patient flow is the defined as the successive movement of people through a sequence of processes along a pathway of care.[128] In this study, patient flow encompassed all the steps between referral into the outpatient clinic, obtaining an appointment and transfer back to community care. In Lean terminology, this is the value stream. An understanding of patient flow was gained by observation during clinic sessions (both in the waiting room and in the staff working areas) and observation and discussion with clinical and clerical staff. Figure 4.1 represents patient movement through Ophthalmology and Plastic Surgery Outpatient clinics (both clinics have a surgical and non-surgical pathway). The clinical redesign project officer (who had previously worked in the role of nurse unit manager) and the clinical redesign project support officer (a senior appointment clerk), both confirmed this representation of patient flow as accurate before the intervention was undertaken. As both the Plastic Surgery and Ophthalmology Outpatient clinics were situated in the same geographical location, they had the same nurse unit manager and shared the same clerical staff. In addition, both clinics had the requirement to schedule post-operative appointments in a timely manner post-inpatient discharge.

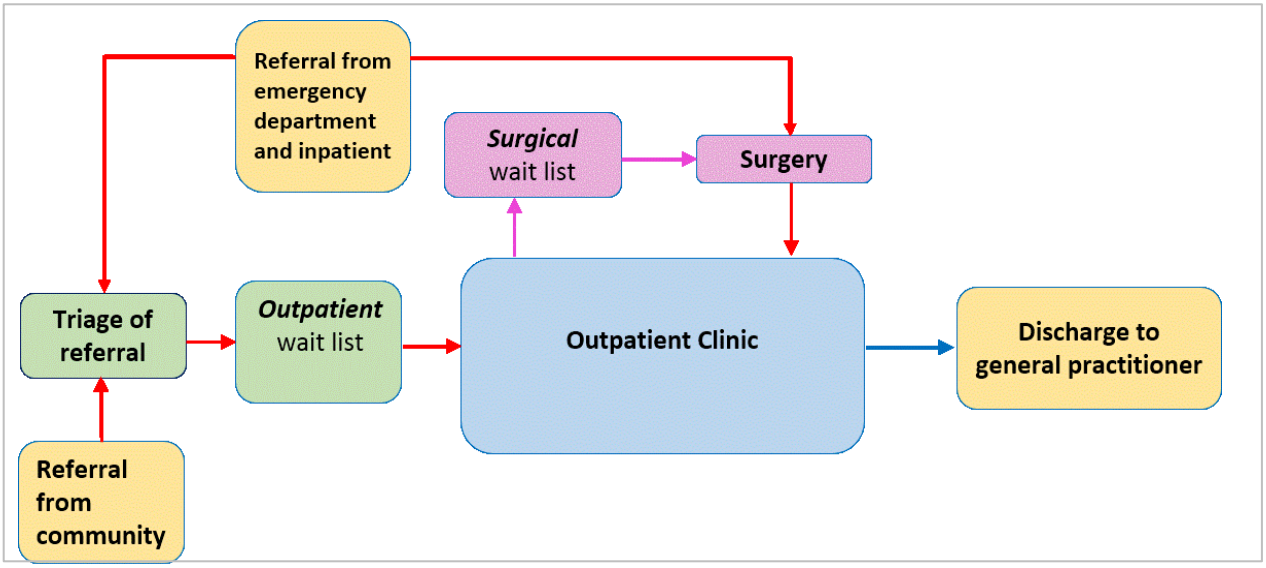


Figure 4.1 Patient flow through both the Plastic Surgery and Ophthalmology Outpatient clinics at the RHH

Patients could be referred into the outpatient clinics from either their general practitioner (or specialist physician), after an attendance at the emergency department, or as an existing inpatient admitted under another speciality. The Ophthalmology Outpatient clinic also accepted referrals from child health nurses and optometrists. Referrals were sent directly to each clinic via facsimile, and were initially triaged by a nurse, followed by a senior medical officer and, if accepted, assigned to one of the three triage categories (as explained in Chapter 2). All accepted patients were placed on an outpatient clinic wait list (even if just for a few hours in the case of an emergency appointment). If the referral was incomplete or did not contain enough information, a phone call was made back to the referrer for the additional detail required and the referral was then placed "on hold". Once the referral was accepted an acknowledgement letter was sent back to the referrer (which did not contain the triage category). Patients also were not informed of the triage category. Patients were normally notified of their appointment by letter, or by telephone if at short notice. A SMS reminder was sent to the patient's mobile telephone three days prior to the appointment. The patient could reply to the text only if they were unable to attend; by sending a reply text containing the letter N (for no). The option to send Y for yes was unavailable.

4.2 Types of appointments

As per the iPM™ patient management system, each outpatient appointment was designated as one of five categories. Each category had a set number of assigned appointment slots each week (except for *walk-in* and *telephone assessments* when appointments were created as required).

- *New* – patients from the wait list.
- *Emergency* – appointments that were only available to book 7-14 days prior to an appointment. These patients were usually urgent referrals or the occasionally unexpected follow-up.
- *Review* –patients had attended at least one appointment previously for the same condition or the appointment was post-surgery.
- *Walk-in* –patients were referred with an urgent condition direct from the emergency department or GP.
- *Telephone assessment* – this was an appointment conducted over the telephone.

Even though there was a fixed number of appointments for each session, the sessions could be overbooked if it was deemed appropriate by a senior clinician.

On the day of their appointment, each patient notified the clerk on arrival and departure from clinic. If a return appointment was required, an appropriate time was negotiated with the clerk, unless the appointment was more than 6 weeks in advance. In this case, the appointment time and date were conveyed to the patient via a letter. This arrangement of not booking appointments more than six weeks in advance was a result of the partial booking policy of appointments. Six weeks was the minimum time that clinicians were required to give notice of planned leave. All appointments were booked manually; a senior nurse allocated appointments according to urgency (for *New* and *Emergency* appointments) whilst also accommodating both post-operative and return appointments into *Review* slots.

After attending a *New* appointment and if surgery was required, patients were transferred to a separate surgical wait list. Not all surgical patients originated from the outpatient wait list. If a patient entered the hospital through the emergency department and were taken directly to the operating

theatre, they bypassed the outpatient wait list. When these patients presented for an outpatient appointment post-discharge, they were classed as a *Review* patient. These initial post-surgery consultations were given priority over long-term follow-up appointments and were usually scheduled between 5 to 10 days post-discharge.

4.3 Clinical redesign meetings

As discussed in Chapter 3, the clinical redesign project officer collated the problems generated from the Big Picture Map into a document for each Working Group. The document's contents became the agenda items for discussion by the Clinical Redesign Working Group and were organised under the following headings.

- Referral process
- Triage of referral
- Booking an appointment
- Wait list management
- Day of clinic
- Outcome of appointment

Both Working Groups consisted of multidisciplinary frontline staff (medical, nursing, allied health and clerical), the same nurse unit manager, a general practice liaison officer (GPLO), project officer, project support officer and the researcher. Both the project officer and project support officer were experienced RHH outpatient clinic staff members who were seconded to the project. A recruitment physician was involved in recruiting the clinics into the program but was not a member of either Working Group. Each agenda item was led by a subject matter expert/clinical champion who was a member of the respective Working Group. The teams were supported by two HSI-based data analysts and a Lean mentor (a Lean-trained nurse). The researcher acted as the intermediary between the Working Groups and the data analysts and assisted in additional data collection (e.g. patient tracking exercises and surveys when required). The data analysts were able to provide extra data to the

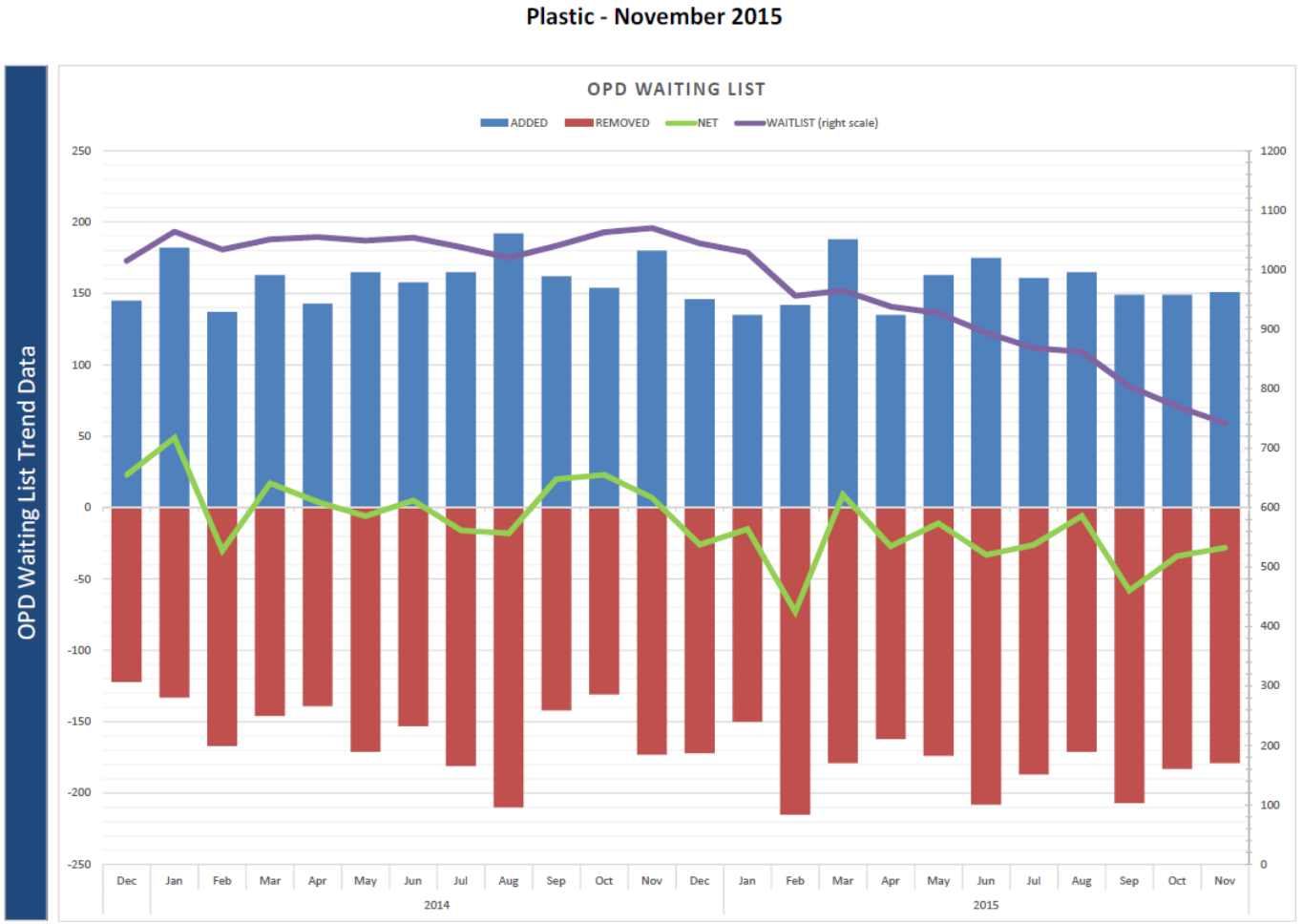
Working Groups when requested e.g. the Ophthalmology Working Group requested a separate wait list for children.

4.4 Clinical redesign data

In the initial proposal for outpatient clinics to be included in the clinical redesign program (dated 17/10/2014), there was concern about the quality of the outpatient wait list and appointment data. This was documented in the proposal with the wording "perhaps a lack of training by some staff, or a lack of reasonable time to complete data entry contributes to incomplete or erroneous data". The extent of the data integrity problems was unknown, but it was felt that the role of the redesign program was to assist in appointment and wait list data cleansing (checking for missing or incorrect entries) and perform audits of the wait lists. This was the rationale behind employing an experienced outpatient clerk to serve as the project support officer.

The hospital was unable to supply real-time data (e.g. wait list numbers) for all the redesign projects. As well as four outpatient redesign groups; there were surgical, medical and patient-flow redesign activities concurrently running which required regular data analysis. HSI was given access to download reports from the iPM™ patient management system. The HSI data analyst provided each Working Group with initially two-weekly, then monthly, information derived from raw data extracted from the iPM™ system. The outpatient data consisted of a three-page report, stipulating the number of patients on the wait list, the additions and removals from the wait list and clinic attendance figures. The report, known as a dashboard, is a method of combining metric and key performance indicators in a visually appealing manner, common in business and IT fields. A three-page Ophthalmology sample dashboard from November 2015 is shown in Figures 4.2, 4.3, and 4.4**,** which displays the wait list, attendance and cancellation data, and DNA rates.

The following chapter concentrates on the evaluation of the Plastic Surgery Outpatient clinic redesign initiatives, which includes a descriptive account of the major problems and staff-led solutions.



Net = Added minus Removed for each month

Figure 4.2 A sample of the HSI-supplied Plastic Surgery Outpatient clinic wait list dashboard

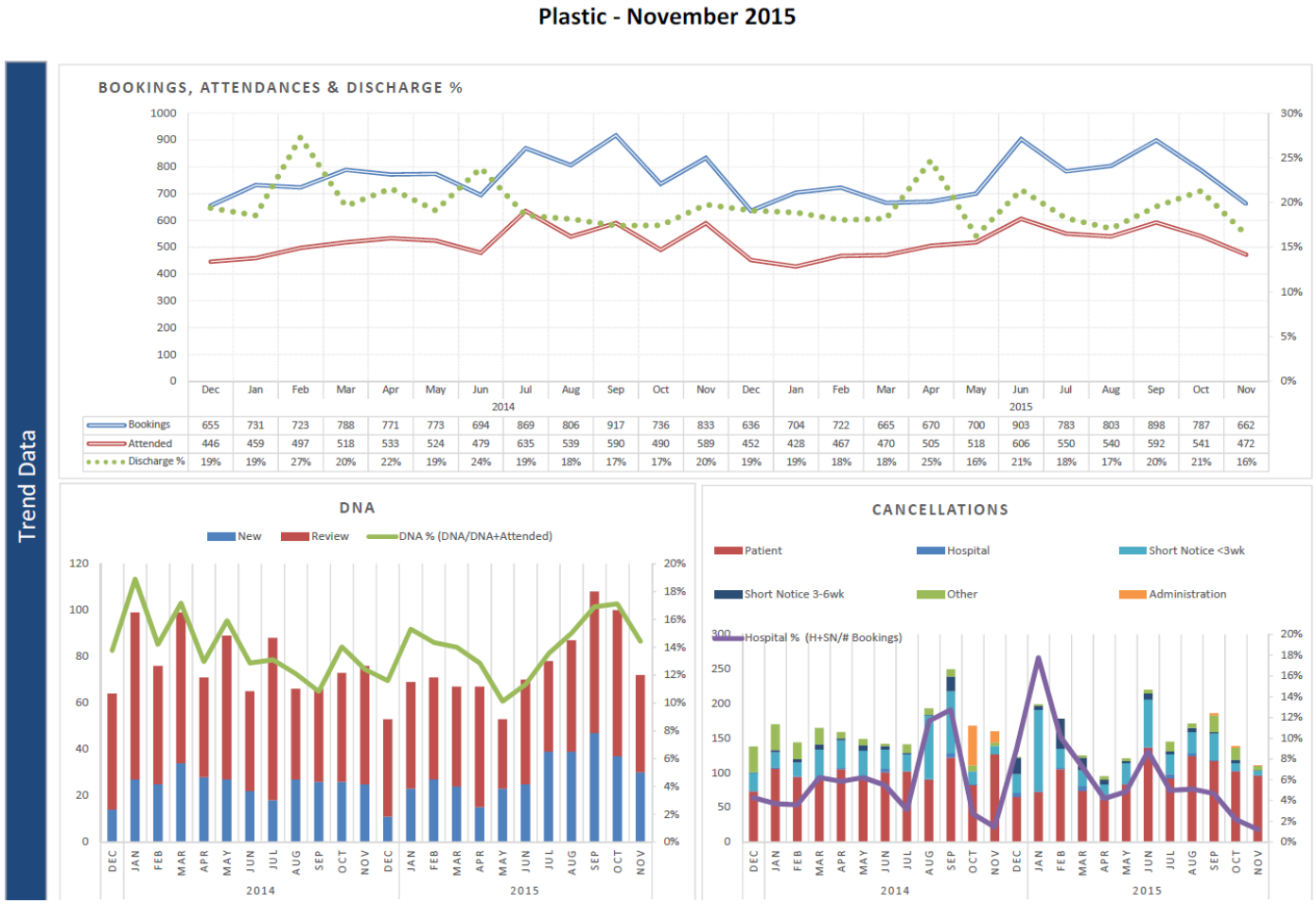


Figure 4.3 A sample of the HSI-supplied Plastic Surgery Outpatient clinic bookings, attendances, DNA and cancellations dashboard

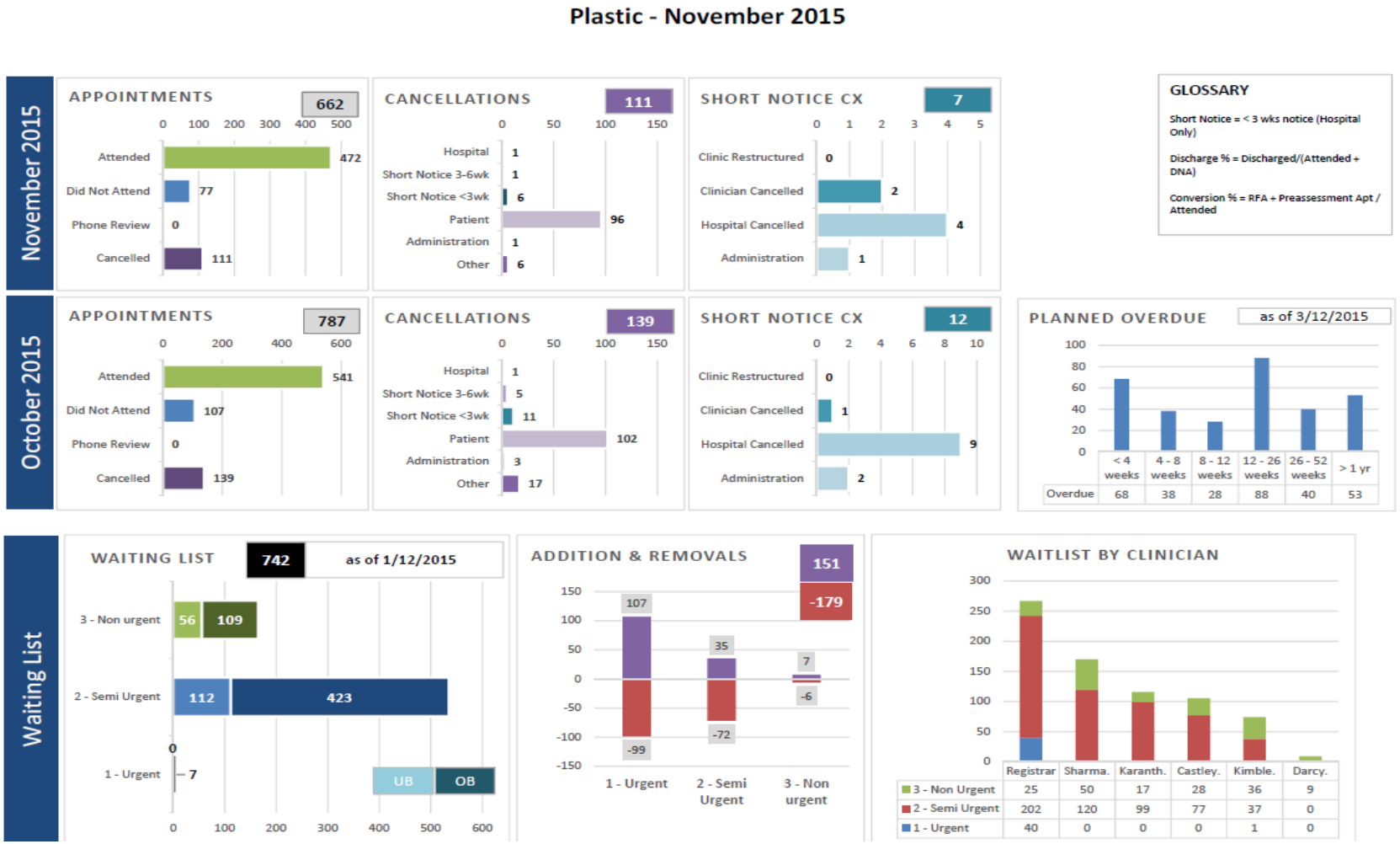


Figure 4.4 A sample of the HSI-supplied Plastic Surgery Outpatient clinic activity dashboard

5 Results: Plastic Surgery

This chapter describes the caseload for the Plastic Surgery Outpatient clinic and four of the main redesign initiatives are subsequently discussed in detail under the headings of: Problem, Solution and Analysis. The results of the staff survey are embedded in the analysis of each activity. The Plastic Surgery Outpatient clinic demographics are then described prior to examination of waiting times, DNA rates, discharge rates, cancellation rates and overdue follow-up appointment statistics. The results and subsequent discussion are framed by the main objective of the evaluation stated in Chapter 1:

> *Does the application of clinical redesign improve patient flow through Plastic Surgery and Ophthalmology Outpatient clinics?*
>
> Patient flow was defined by the following measures:

- Percentage of patients who waited longer than the clinically recommended time before attending their first outpatient appointment by triage category
- Median wait time to the first appointment by triage category
- Did Not Attend (DNA) rate
- Discharge rate
- Hospital and patient appointment cancellation rates
- The number of overdue follow-up appointments

5.1 Caseload

At the commencement of the study, the Plastic Surgery caseload was approximately 150 admissions (surgeries) per month with 50% comprising trauma cases. With full staffing, up to 189 appointments could be scheduled each week (39 *New* appointments, 134 *Review* appointments, and 16 *Emergency* appointments). Four plastic surgeons worked part-time with registrars, resident medical officers (RMOs) and intern medical staff all consulting with patients during a clinic session. All *New* appointments were allocated to a consultant, whilst return patients were assigned to either a consultant or registrar. The two main registrar clinics were held on Tuesday and Thursday afternoons (with consultants in attendance), at the same time as a co-located hand physiotherapy clinic in an

adjacent room. These registrar afternoon clinics were divided into two sessions; the hand clinic began at 1.30 pm and the general plastics clinic at 2.40 pm. The hand clinic was rostered earlier (i.e. before the plastics clinic), because many patients required a hand physiotherapy appointment after their appointment with the registrar. The earlier scheduling of hand clinic was to enable patients enough time to visit both the registrar and physiotherapist in the same afternoon. The staffing composition did not change between the hand clinic finishing, and the general plastics clinic commencing.

5.2 Interventions

The major clinical redesign interventions were grouped into one of four major themes.

- Staff flow during clinic
- 'Physio first' model of care
- Nurse-led clinic
- Clinical Guidelines and policies

The identified problems for each theme will be discussed, followed by the staff-led solution and then the analysis of the solution.

5.2.1 Staff flow during clinic

Problem

Each consulting room in the Plastic Surgery Outpatient clinic had two entrances – one patient entrance via a corridor connected to the waiting room and the other for staff (Figure 5.1). When a consulting room became vacant, a nurse proceeded to the waiting room and directed each patient in turn to walk up one of the two corridors to enter a numbered room. The nurse then entered the same consulting room via the staff door, removed the wound dressing (if present) and notified a doctor that the patient was waiting. If the clinic session was one of the registrar clinics (Tuesday or Thursday afternoon), the doctors were not allocated to specific patients and the next available doctor was notified (all *New* patients were allocated to a consultant). Patients were then waiting alone in the room until a doctor was free.

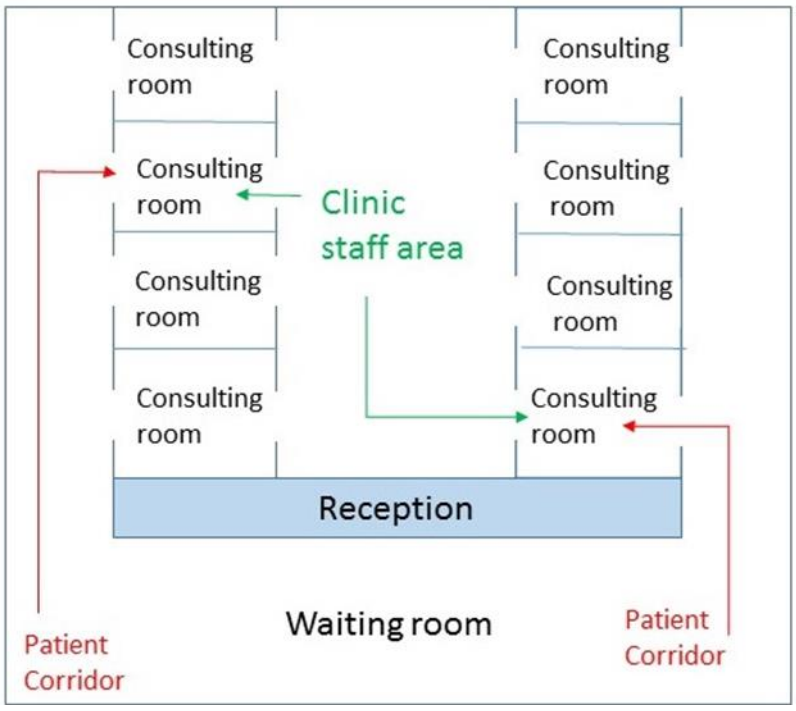


Figure 5.1 Schematic diagram of the Plastic Surgery Outpatient clinic

Due to the long corridor in the clinic staff area, it was difficult for staff (both doctors and nurses) to visualise which rooms were empty and which rooms contained a patient yet to be allocated a doctor (Figure 5.2). During the observation sessions, the researcher noted instances when patients (who were alone in a consulting room) were approached on more than one occasion by a doctor enquiring if they were being attended to. Commonly, the attending doctor had left the consulting room to retrieve equipment or liaise with another staff member. There was no documentation (outside the consulting rooms) stating which patient was in each room or if they had been allocated a doctor.

Figure 5.2 View down the corridor to the consultation rooms

Another issue identified by the researcher was the impaired patient flow when junior doctors left their patients to seek the assistance of senior clinicians. There was often a queue of interns and RMOs waiting outside consulting rooms known to contain a senior doctor. At times, multiple junior doctors

were waiting for the advice of the same senior clinician. These two issues were brought to the attention of the Working Group in May 2015.

Solution

Due to the lack of visual cues in the clinic signalling which rooms were vacant and which patients were waiting for a doctor, the Working Group allocated nurses to designated rooms to aid patient flow. The nurses maintained their usual clinical duties but monitored patient and medical staff movements in a smaller number of rooms than previously. One of the senior medical clinicians was assigned the role of 'helicopter' physician, to 'hover' around clinic and assist junior doctors with diagnosis and treatment decisions. This senior doctor was not usually assigned to see patients. Figure 5.3 is a photograph of how the nursing and medical staff were notified of their roles during a clinic session via the main whiteboard in the staff working area. This photograph was taken during the first clinic for the new staffing roles. As part of the change to staff flow, a coloured folder was placed outside the consulting room by a nurse when a medical staff member was required in that room. The aim of the coloured folders was to save time searching for an unoccupied staff member. This method of requesting medical staff (registrar and consultant) was discussed at the redesign meetings and, as such, folders in two colours (blue and red) were ordered. At the start of this clinic session, a senior staff member added "Green = nurse" to the board, but green folders were unavailable, as only medical staff were part of the original plan. The colour folder system caused staff confusion and was abandoned after one clinic session, but the 'helicopter' model (below) continued throughout the data collection period.

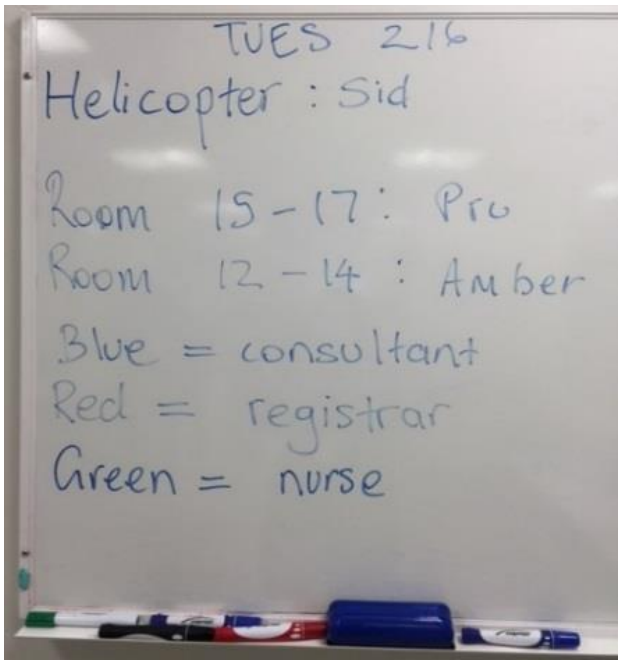


Figure 5.3 Staff allocation on first day of the 'helicopter' model

Figure 5. 4 'Helicopter' prop made by the nursing staff

The lead nurse (nurse-in-charge) of each clinic session was also given a 'helicopter' role, after the medical model gained staff approval. The lead nurse made a real size helmet with a toy helicopter attached to display in the staff corridor. At times, the prop was used (worn briefly) by both medical and nursing staff to reinforce the new model of staff flow (Figure 5.4). It was the role of the lead nurse to monitor if the clinic session was running behind schedule, provide nursing assistance with complicated patients, and ensure that the 'Did Not Attend' paperwork was completed by the doctors at the end of the session. An updated example of how the staff were advised of their roles is shown in Figure 5.5.

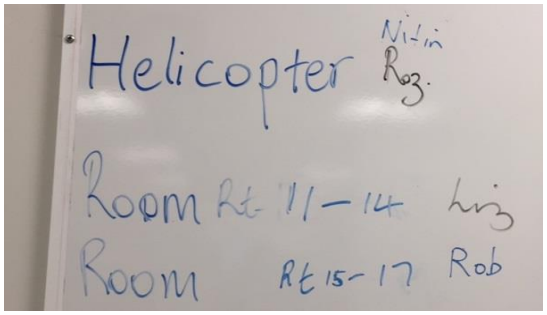


Figure 5. 5 Medical and nursing staff allocation of 'helicopter' roles

Analysis

Staff were asked their perceptions of the changes to clinic flow (Table 5-1) as part of the staff survey administered at the end of the redesign program.

To what extent do you agree with the following statements regarding the new changes to clinic flow?

Table 5-1 Survey results: Staff perception of the changes to clinic flow

Question	Strongly agree (%)	Agree (%)	Unsure (%)	Disagree (%)	Strongly disagree (%)	n
Q1. There is less time waiting for advice from senior clinical staff	9.5	47.6	33.3	9.5	-	21
Q2. Patients are more likely to be seen on time	9.5	47.6	19	19	4.8	21
Q3. Clinics are more likely to start and finish on time	4.8	47.6	14.3	28.6	4.8	21
Q4. There is more opportunity for teaching during clinic	9.5	42.9	38.1	4.8	4.8	21
Q5. Patients spend less time alone in the consultation room	-	42.9	33.3	19	4.8	21

More than half the staff who answered the questions (except Q.5) agreed with all the statements, depicting a positive change to clinic flow. Only nine out of 21 respondents agreed that 'patients spend

less time in the consultation room' because of the 'helicopter' model. Six out of eight medical staff felt there was more opportunity for teaching during clinic.

In the free text field, *Reflections of changes to clinic flow* received the largest number of comments of the four initiatives. Overall, the changes were perceived as positive, but one junior medical staff member indicated that patients receive less continuity of care by not having an allocated doctor, and one consultant suggested that patients should be designated "for each person in clinic". Prior to the redesign program the patients had not been allocated to a doctor in the afternoon registrar clinics.

One nurse suggested that there should be "less follow-up post simple surgery"; this comment was supported by a senior hand physiotherapist at the redesign meeting as the staff survey results were relayed back to the Working Group. The medical officer participation in the Working Group meetings had ceased by this time. Further comments by two physiotherapists voiced the need for more planning around the times of reduced clinic capacity (planned leave and public holidays). The Working Group agreed that junior doctors were being too strict on the time frames for simple review post-operative appointments and questioned the need for post-operative follow-up appointments to be scheduled exactly between 5 and 7 days after an operation. This was a common theme at the clinical redesign meetings near the end of the data collection period, by which time the medical staff member had ceased attendance.

Seven staff members commented on the causes of interruptions to clinic flow with the new 'helicopter' model. Their view was that problems were still occurring when:

- staff members did not stick to their allocated role;
- there were too many junior medical staff;
- medical staff either spent too long with a complicated patient; or
- medical staff were asked to attend elsewhere in the hospital.

Five staff members remarked on the variable numbers of patients still present (post-redesign) in some clinics (one respondent mentioned this problem was present in afternoon clinics only).

5.2.2 'Physio first' model of patient care

Problem

The median waiting time waiting time to see a plastic surgeon for many triage category 2 hand and wrist conditions was over 500 days (as at April 2015).

Solution

The waiting time to see a hand physiotherapist at the co-located hand physiotherapy clinic was less than the wait time to see a plastic surgeon. Not all patients with hand and wrist problems required surgery as the symptoms may be relieved by placing the wrist in a personalised splint constructed by the physiotherapists.

The 'physio first' model of patient care was established for the following three hand conditions:

- trigger finger (stenosing tenosynovitis) where one finger becomes locked in a bent position;
- osteoarthritis of the first carpometacarpal joint (OA of the CMC); and
- carpal tunnel syndrome (median nerve compression from the palm to forearm).

In this new model of care, the existing Plastics Surgery Outpatient wait list was examined to find suitable patients to be contacted by telephone to enquire if they would prefer to consult a physiotherapist whilst remaining on the wait list to see a plastic surgeon. A triage nurse supplied the physiotherapy booking clerk with a list of patient names. The operational guidelines for the clinic were established in November 2015, and potential patients were contacted by telephone. As at 30/06/2016, the hand physiotherapists had not seen any patients for potential splinting.

Analysis

Investigations revealed two main reasons for the failure of the model; an insufficient number of hand physiotherapy staff and an inadequate triage system of suitable patients. The staffing levels of hand physiotherapists allocated to the Plastics Surgery Outpatient clinic had been halved over the preceding 4 years, without a decrease in patient numbers. This staffing issue was highlighted by the hand physiotherapists during the 2-day redesign workshop in March 2015. In addition, inexperienced staff were at times rostered to the hand physiotherapy clinic who could not consult with as many patients as their more experienced colleagues. Despite the lack of staff, the 'Physio first' program decided to accept referrals for splinting. Feedback from the physiotherapy booking clerks indicated that those patients who were contacted (number unknown) all refused the service as they had already been treated or did not require treatment. This led to the already overworked physiotherapy staff ceasing to contact patients by March 2016.

The staff survey results regarding the 'Physio first' model is shown in Table 5-2

Table 5-2 Survey results: Staff perception of the 'Physio first' model of care

Question	Strongly agree (%)	Agree (%)	Unsure (%)	Disagree (%)	Strongly disagree (%)	n
Q6. I am aware of the 'physio first' model of patient care	23.8	38.1	14.3	9.5	14.3	21
Q7. The guidelines are clear regarding the patients suitable for this treatment pathway	18.2	31.8	31.8	9.1	9.1	22
Q8. The referral process is easily understood by me	13.6	54.5	22.7	4.5	4.5	22
Q9. Early intervention is beneficial for patients with these conditions	42.9	33.3	19	4.8	-	21
Q10. This initiative places extra stress on the physiotherapy clinic staff	23.8	4.8	47.6	23.8	-	21

Thirteen staff members were aware of the' Physio first' model, but two registrars and one consultant were unaware of the program. All three physiotherapists knew about the program, including the treatment guidelines and referral process. Six out of eight doctors agreed or strongly agreed that 'Early intervention by a physiotherapist is beneficial for patients with these conditions'. Ten out of the 21 staff members were unsure if 'This initiative places extra stress on the physiotherapy clinic staff', while two physiotherapists 'strongly agreed' and the third 'disagreed' with this statement.

Overall most staff indicated the initiative was a good idea, but due to a lack of staff and inadequate triage system, the program failed to see any patients.

5.2.3 Nurse-led clinic

Problem

One of the issues identified at the 2-day workshop was the casemix of patients attending the busy Tuesday and Thursday afternoon registrar clinics. The participants thought that too many patients were attending clinic with conditions that could be managed by experienced nurses. Another comment was that some dressing changes were too time intensive to take place during the clinic and should occur at a separate time.

Solution

A new weekly clinic was established each Tuesday morning for dressing changes and to monitor external fixtures (inserted during hand and wrist operations). Two nurses were rostered to run this clinic, consisting of eight appointment slots. If medical advice was required, the patients could remain in the clinic and consult a doctor during the subsequent medical clinic. Referrals could only be made for existing clinic patients and by the RHH Plastic Surgery doctors. The referring doctor internally referred patients using the existing *Outcome Form* (the existing form which every patient presents to the receptionist on departure, specifying if a new appointment was needed or the patient was to be discharged from clinic). On receipt of the *Outcome form,* the patient was booked into the next

available clinic by the receptionist, with the time and date agreed to by the patient. The first patients were booked for the nurse-led clinic starting on 9/6/2015.

Analysis

It was recorded in the Working Group meeting notes on the 27/7/2015 that the nurse-led clinic was underutilised. During the clinic's first month of operation, the equal highest number of patients *Attended* an appointment, but the clinic was still only at 40% of its capacity (full capacity was 8 appointments every Tuesday). Patient attendance at the clinic over the study period was inconsistent as shown in Figure 5.6. Overall there were 93 *Attended* appointments. The DNA rate was low for this clinic – only 5 patients failed to attend their appointment in the 13-month period of data collection. The DNA rate was 5.1%, well below the overall Plastic Surgery Outpatient DNA rate of 13.7%.

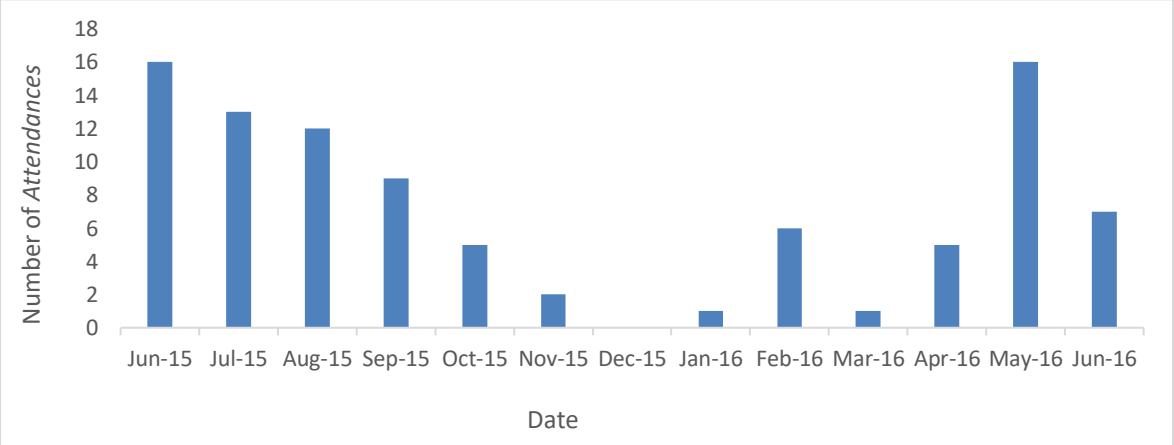


Figure 5.6 Monthly attendance figures at the Plastic Surgery nurse-led clinic held on Tuesday mornings

The staff were asked five questions about the implementation of the nurse-led clinic (Table 5-3).

Table 5-3 Survey results: Staff perception of the implementation of the nurse-led clinic

Question	Strongly agree (%)	Agree (%)	Unsure (%)	Disagree (%)	Strongly disagree (%)	n
Q11. I am aware of the nurse-led clinic	36.4	59.4	-	4.5	-	22
Q12. The guidelines are clear regarding patients for this treatment pathway	28.6	38.1	23.8	4.8	4.8	21
Q13. The nurse-led clinic is currently underutilised	40.9	31.8	27.3	-	-	22
Q14. The discharge guidelines for the nurse-led clinic are clear	4.5	31.8	45.5	13.6	4.5	22
Q15. The patients who are seen at this clinic are clinically appropriate	13.6	50	36.4	-	-	22

All except one staff member were aware of the nurse-led clinic. The staff members who answered 'unsure' to the question 'the guidelines are clear regarding the patients suitable for this treatment pathway' consisted of a consultant, a registrar, two interns/RMOs and one physiotherapist. Three out of the four booking clerks agreed that the guidelines were clear.

Eight staff members in the free text section titled "What has not worked so well?", commented on the underutilisation of the nurse-led clinic. One nurse complained about the lack of formal guidelines surrounding clinic procedures and one nurse commented "the clinic should encourage doctors to let go of the need to visualise outcomes of simple surgeries".

Two months prior to the staff survey distribution, the researcher asked the Working Group if nurses were permitted to discharge patients from the nurse-led clinic. The group was unsure but would discuss the question with the senior clinicians. The Working Group was aware of this question being a part of the staff survey, and the researcher was assured that the discharge guidelines would be finalised by the time the survey was distributed. The discharge guidelines were not completed at the

time of the staff survey, but eight staff members agreed with the statement “The discharge guidelines regarding the nurse-led clinic are clear”.

None of the staff deemed the patients attending the clinic to be clinically inappropriate, but one consultant, one registrar and two intern/RMOs were “unsure”. The respondents were the same four medical staff who answered “unsure” to Q.14 “The guidelines are clear regarding the patients suitable for this treatment pathway”. This response suggests these doctors were not fully aware of the referral guidelines and patient suitability for the nurse-led clinic.

5.2.4 Clinical guidelines and policies

Problem

It was observed that some patients repeatedly missed appointments, and the Working Group queried if the clinic staff were abiding by the DNA policy. There were also deliberations amongst the staff about whether the DNA policy stated that patients could be discharged if one or two clinic visits were missed.

Solution

It was identified that a DNA policy had been drafted but had not been endorsed by the hospital executive. This policy applied to all THO South Outpatient clinics. The document was finalised and approved in June 2015. The main points of the policy were:

> A patient will be removed from the appointment waiting list or clinic schedule following the patient’s first failure to attend (FTA) for a new appointment or their second FTA for a follow-up or review appointment, unless prior notice and good cause is provided.

Analysis

As with previous initiatives, the staff were asked five questions regarding the implementation of the new DNA policy (Table 5-4). The DNA policy was the only initiative in the survey that was also introduced into other outpatient clinics. Given that some staff members (nurses and clerks) also worked in other outpatient areas there was potential for recall bias, due to the DNA policy promotion

in the other clinics. This did not seem to be the case as only ten out of 22 staff were aware of the new DNA policy. In the remaining survey questions, three staff members stated that they had read the policy, four had referred to the policy, five agreed it was well implemented and three respondents thought it increased general patient access to clinics. The staff who had referred to the policy consisted of three nurses and a consultant.

Table 5-4 Survey results: Staff perception of the implementation of the new Did Not Attend policy

Question	Strongly agree (%)	Agree (%)	Unsure (%)	Disagree (%)	Strongly disagree (%)	n
Q16. I am aware of the new DNA policy	9.1	36.4	36.4	18.2	-	22
Q17. I have read the new DNA policy	9.5	4.8	28.6	47.6	9.5	21
Q18. I have referred to the new DNA policy for information regarding a patient	9.1	9.1	22.7	45.5	13.6	22
Q19. The new DNA policy was well implemented	4.5	31.8	45.5	13.6	4.5	22
Q20. The new DNA policy increases general patient access to clinics	5	10	70	15	-	20

The full analysis of the DNA appointment statistics will be discussed in Section 5.3.6.

Problem

The Working Group decided that many clinic policies and procedures had never been formally documented, which created confusion for new and existing staff members.

There was also a consensus amongst all four Working Groups that the GP referral acceptance letter should contain the triage category of accepted patients, and the referral refusal letter should include the documented reason for refusal.

Solution

Four care guidelines were written for the Plastic Surgery clinic staff.

- K-wire care protocol (Kirschner wire is a type of stabilization wire for fractured bones used in orthopaedic and plastic surgery. The end of the wire protrudes through the skin, so it can be removed easily in clinic once the fracture has healed)
- General principles for nurses
- Orientation to clinic for clinicians
- Guidelines for plastic surgery follow-up appointments (for junior medical staff)

Once written, the new clinic guidelines were placed as a hard copy in a folder in the communal staff working area (and were not available on the hospital intranet). The new junior medical staff were supplied with hard copies of the policies at the start of each staff rotation.

The four Working Groups in conjunction with clinic management formulated new clinic acceptance and refusal letters in which the referrer was informed of the triage category of all accepted referrals and the reason given for the non-acceptance of a referral.

Analysis

The staff were surveyed on their awareness and location of the four new clinic guidelines (Table 5-5).

Table 5-5 Survey results: Staff knowledge of the new Plastic Surgery clinic guidelines

Guideline	Are you aware the guidelines have been written?		Do you know how to access the guidelines?		n
	Yes (% of staff)	No (% of staff)	Yes (% of staff)	No (% of staff)	
K-wire care protocol	42	58	42	58	24
General principles for nurses	46	54	42	58	24
Orientation to clinic for clinicians	50	50	46	54	24
Guidelines for plastic surgery follow-up appointments	50	50	50	50	24

Three out of 8 doctors, 4/8 nurses and 1/3 physiotherapists were aware of the new K-wire care protocol (the other 2 staff were clerks from the Working Group). Four nurses knew about the "General principles for nurses" guideline, but only 3 knew how to access it. Six doctors were aware of the

"Orientation to clinic for clinicians" but only four could access the guidelines. Four of the six junior doctors were aware of the "Guidelines for plastic surgery follow-up appointments" and how to access them.

The staff survey also included questions regarding changes in communication as a result of the program. Staff communication within their own professional discipline was perceived to be the largest change (12 positive and 1 very positive). Eleven out of 19 staff members indicated there was no perceived change in communication between staff and patients because of the redesign activities (Figure 5.7).

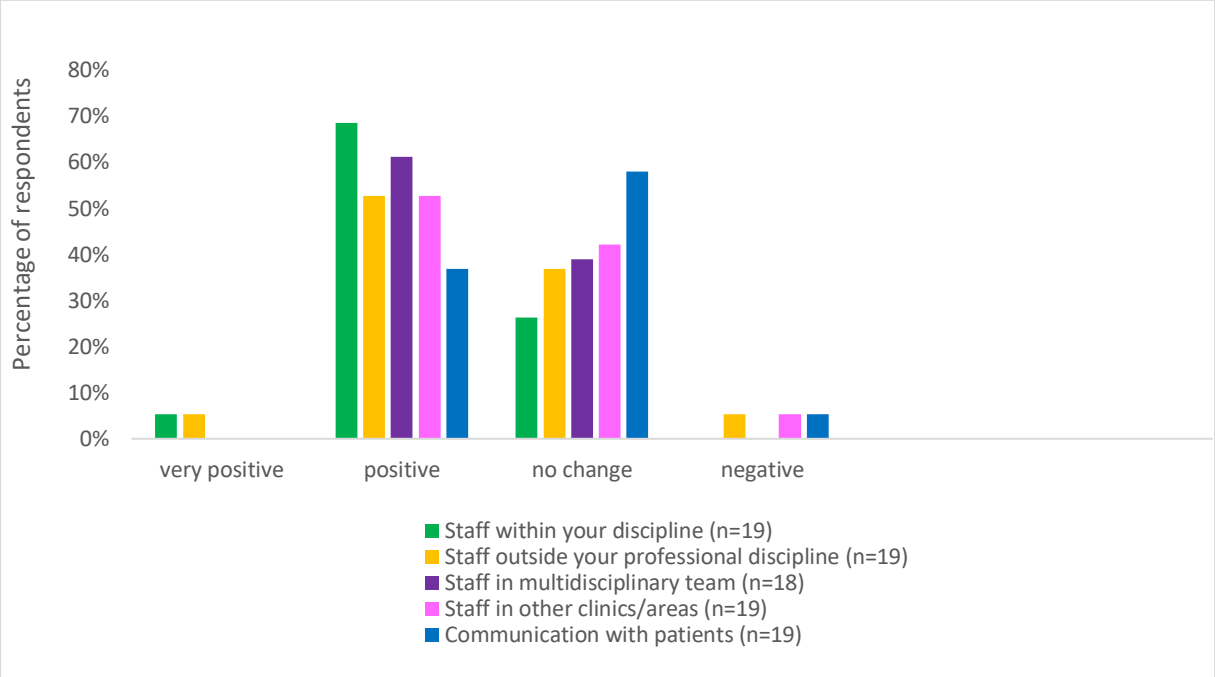


Figure 5.7 Survey results: Staff-perceived change in communication post-redesign

5.3 Changes to patient flow

This section of the results evaluates the changes to patient flow in the clinic system as framed by the research question:

> *Does the application of clinical redesign improve patient flow through Plastic Surgery and Ophthalmology Outpatient clinics?*
>
> Patient flow was defined by the following measures:

- Percentage of patients who waited longer than the clinically recommended time before attending their first outpatient appointment by triage category
- Median wait time to the first appointment by triage category
- Did Not Attend (DNA) rate
- Discharge rate
- Hospital and patient appointment cancellation rates
- The number of overdue follow-up appointments

Patient flow can be described by the interconnection and relationship between the outpatient wait list, the outpatient clinic activity (appointments), the number of plastic surgery theatre cases and the discharge of patients back to community care.

To ensure that a potential increase in patient flow was a direct result of the clinical redesign program, a patient flow diagram was constructed to include all possible explanations for an enhanced movement of patients through the outpatient clinic system. All these explanations were considered as part of the evaluation of the program.

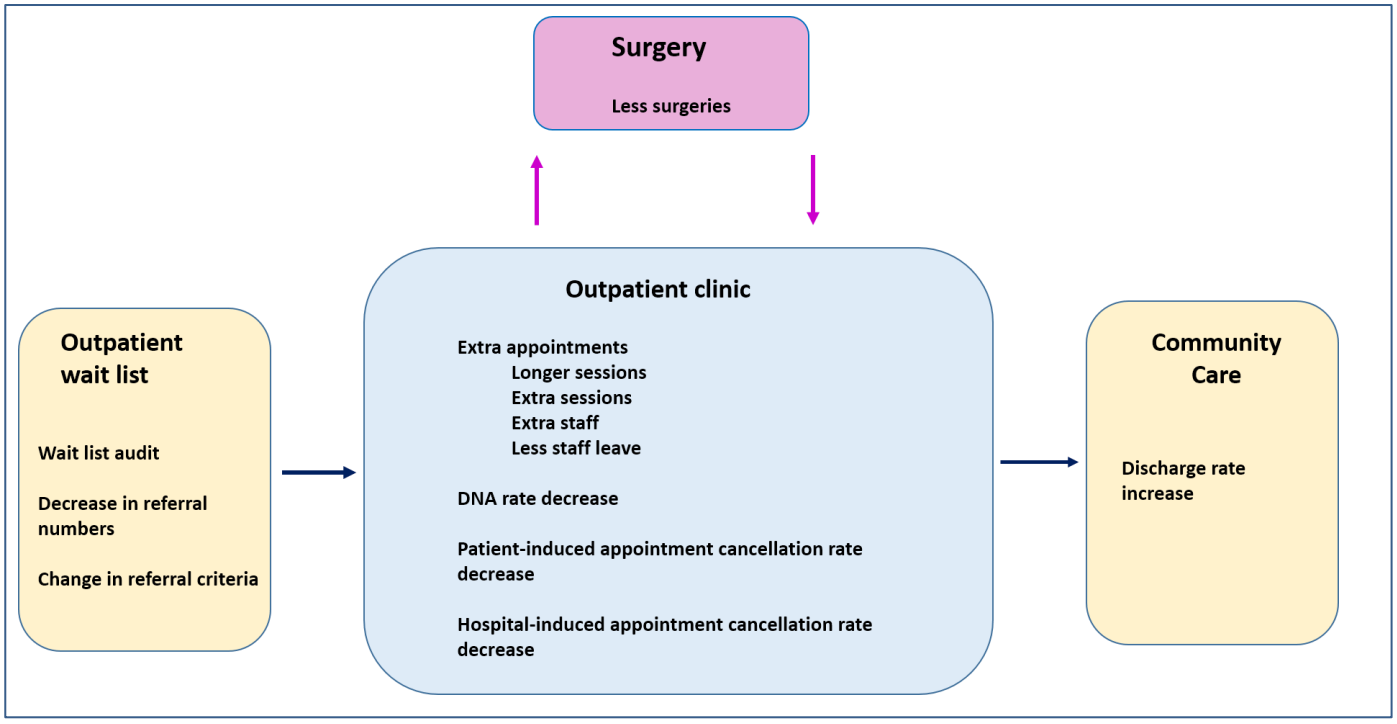


Figure 5.8 Possible explanations for an increase in patient flow through the Plastic Surgery Outpatient clinic

Each of the four areas will be investigated to understand how the clinical redesign program impacted patient flow.

5.3.1 Plastic Surgery Outpatient wait list

The analysis of the changes to clinic flow began with a comparison of the number of patients on the wait list between the Pre-study and Intervention periods. Fifteen months was chosen for the Pre-study period to match the timeframe of the Intervention period. The Intervention period had 5 clinic working days less than the Pre-study period. Table 5-6 outlines key demographic comparisons. The number of patients added to the wait list were almost identical for the two periods (2412 vs 2417). Most patients added to the list were triaged as category 1, the next most frequent was category 2, and category 3 had the smallest number of patients. These ratios remained constant throughout the entire study period. Most category 1 patients were male (63% in both periods).

Table 5-6 Plastic Surgery Outpatient clinic study demographics

Pre-study period (January 2014- March 2015)	**Intervention period (April 2015 – June 2016)**
454 calendar days	456 calendar days
187 clinic working days	182 clinic working days
2412 additions to Plastic Surgery Outpatient wait list comprising of: Category 1 = 67% (63% male) Category 2 = 27% (45% male) Category 3 = 4.6% (40% male) Unknown = 1.4%	2417 additions to Plastic Surgery Outpatient wait list comprising of: Category 1 = 67.6% (63% male) Category 2 = 28.6% (43% male) Category 3 = 3.4% (33% male) Unknown = 0.3%
2031 Plastic surgery theatre cases	2133 Plastic surgery theatre cases

In 2012-13 the AIHW reported the ratio of hospitalisation due to injury of males to females in Australia was 1.3:1.[(129)] The ratio of males to females in the study is consistent with half the Plastic Surgery theatre cases being trauma-related. The proportion of females increased with decreasing triage category (which are less likely to be due to trauma). The age distribution of the patients added to the wait list in the two time periods was similar, with an even and wide distribution across ages groups, especially from 15-70 years of age (Figure 5.9 and Figure 5.10).

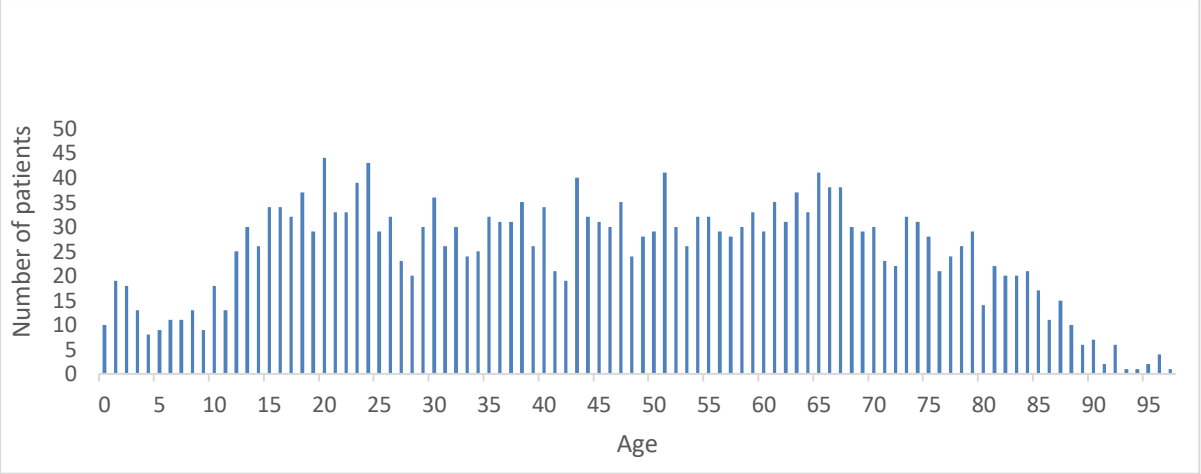


Figure 5.9 Ages of patients at date added to Plastic Surgery Outpatient wait list (Pre-study)

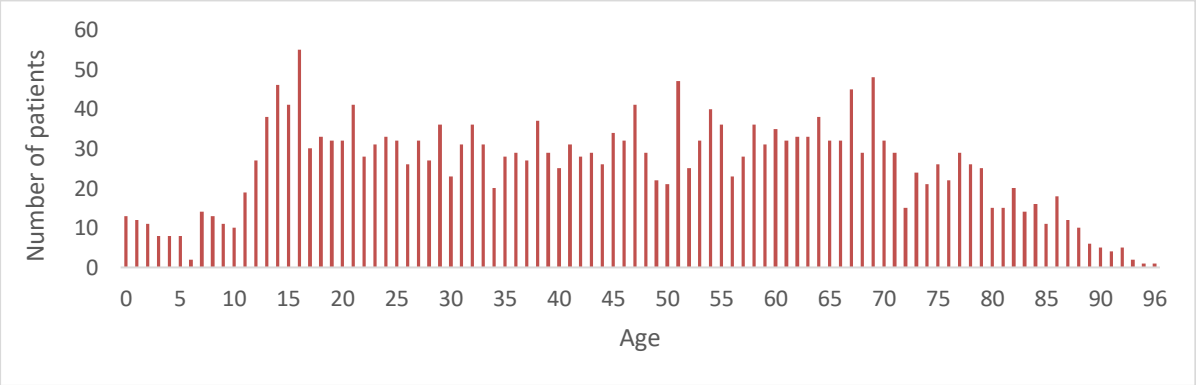


Figure 5.10 Ages of patients at date added to Plastic Surgery Outpatient wait list (Intervention)

5.3.2 Wait list analysis

As previously mentioned, all the clinical redesign Working Groups received real-time wait list information and the change in the wait list numbers became the starting point of the analysis of patient flow. At the beginning of January 2014, there were 1049 patients on the wait list and at the end of the Pre-study period the number of people on the list had decreased to 1000 patients. This period included a wait list audit (unrelated to the current redesign program) in which 65 patients were removed. These patients were on the wait list longer than 365 days and were removed because they were unable to be contacted by mail or telephone to verify their intention to remain on the wait list. Nine patients were category 2 and 56 were from category 3. During the next 15 months, the wait list number continued to decrease and by the end of June 2016, there were 689 patients on the wait list. There were no audits of the wait list during the Intervention period. The change in the wait list

numbers over the 30-month study period is shown in Figure 5.11, and this was how the final report was presented to the Plastic Surgery Working Group at the completion of the project.

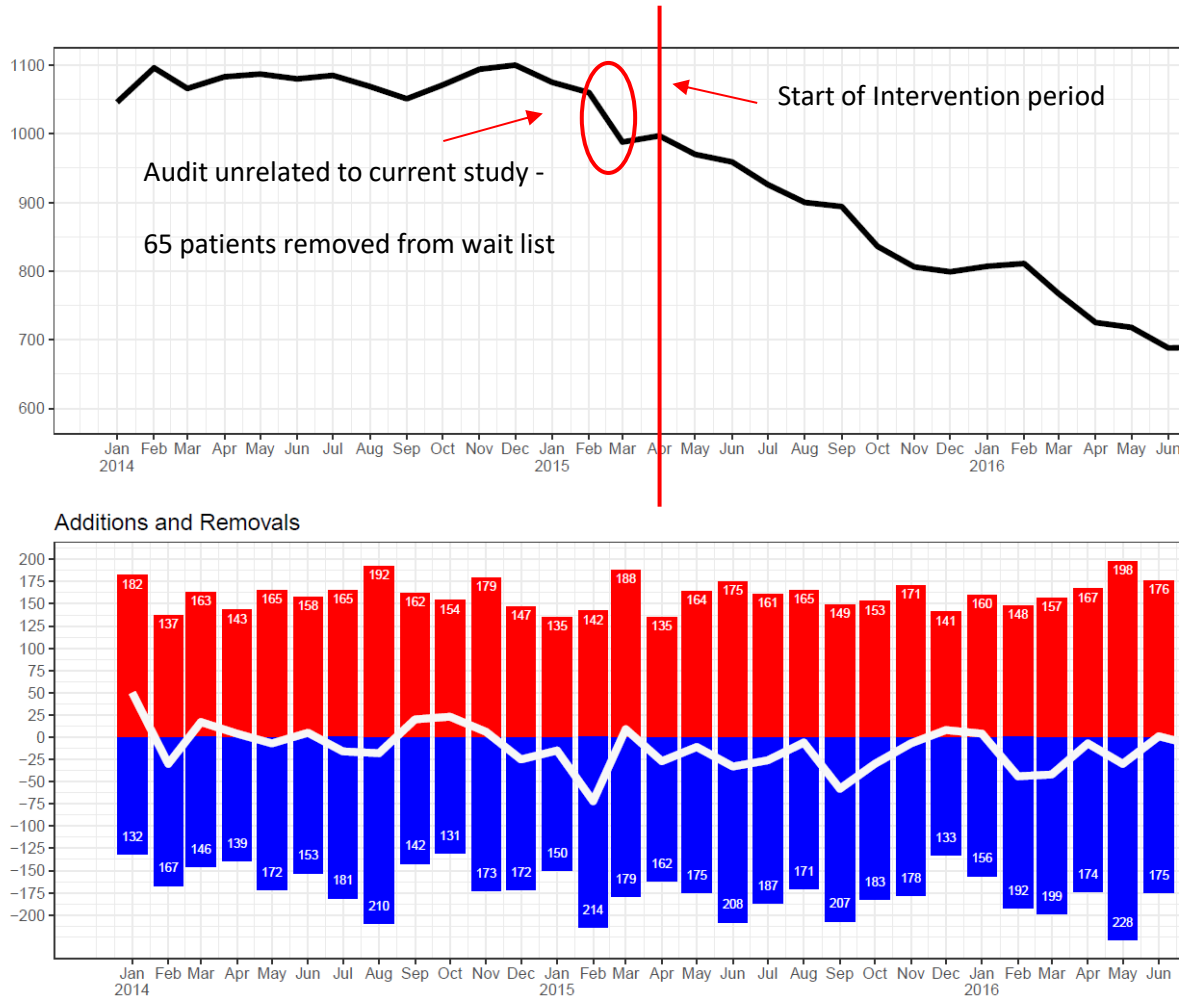


Figure 5.11 Plastic Surgery Outpatient clinic wait list from January 2014 to June 2016 (Pre-study and Intervention period)

The largest difference between the additions and removals to the wait list occurred in triage category 2 patients, where there were 47 net additions Pre-study, and 232 net removals during the Intervention period (Table 5-7).

Table 5-7 Plastic Surgery Outpatient clinic additions and removals to the wait list

	Pre-study period			Intervention period			p-value for difference (Chi-square)
Triage category	**Additions**	**Removals**	**Net**	**Additions**	**Removals**	**Net**	
1	1627	1639	-12	1634	1679	-45	**0.69**
2	650	603	+ 47	692	924	-232	**<0.00001**
3	111	191	-80	83	117	-34	**0.29**
unknown	24	28	-4	8	8	0	**0.79**
Total	**2412**	**2461**	**-49**	**2417**	**2728**	**-311**	

Wait list removals were most commonly due to attendance at clinic, but there were other reasons e.g. not requiring treatment; receiving treatment elsewhere; removal due to DNA; and death. When patients *Attended* their appointment, removal from the wait list was automatic via the iPM™ patient management system. All the other methods of removal from the wait list were manual tasks usually completed by the clerical staff.

When an appointment was no longer required and was not cancelled by the patient, the appointment slot remained unoccupied and was marked as a DNA for that appointment on iPM. A clerical staff member then contacted patients who were listed as DNA (*New* appointments only), to ask if another appointment was required and, if so, subsequently allocated the patient a replacement *New* appointment. If the patient did not require another appointment, the clerk would manually remove the patient from the wait list. Patients remained on the wait list until their first appointment was *Attended* or until they were manually removed from the wait list.

5.3.3 Clinic attendance from the wait list

The next step was to investigate if the increased number of category 2 removals from the wait list corresponded to an increased number of category 2 patients who *Attended* an appointment from the wait list (Table 5-8).

Table 5-8 Patients from the wait list who **Attended** *the Plastic Surgery Outpatient clinic*

	Pre-study period		Intervention period		% change	p-value for difference (chi-square)
Triage category	**Number of patients**	**Percentage of total**	**Number of patients**	**Percentage of total**		
1	1459	75.5 %	1528	68.3 %	- 7.2 %	<0.00001
2	387	20.0 %	631	28.2 %	8.2 %	<0.00001
3	62	3.2 %	70	3.1 %	- 0.1 %	0.88
Unknown	24	1.3 %	8	0.4 %	-0.9 %	0.0011
Totals	1932	100 %	2237	100%		

There were 305 more patients who *Attended* an appointment from the wait list during the Intervention. This was an increase of 15.8 %. As expected, the largest rise was in category 2 where the raw attendance numbers increased from 387 to 631 patients. Even though all triage categories showed an increased number of attendances, the proportion of category 1 attendances decreased from 75.5 % to 68.3 %, whereas category 2 patients showed a similar increase in proportion from 20% to 28.2 %. This corresponds to Table 5-7, which indicates that the majority of the category 2 patients who were removed from the wait list *Attended* a clinic appointment.

5.3.4 Waiting time analysis

As there was an increase in the number of appointments *Attended* from the wait list, the next stage in the evaluation was to investigate if this finding resulted in a change of patient flow as measured by a change in:

- the percentage of patients who waited longer than the clinically recommended time before attending their first outpatient appointment by triage category; and
- median wait time to the first appointment by triage category

Each triage category will be analysed separately.

5.3.4.1 Category 1 patients waiting time analysis

The target for category 1 patients was to attend the first appointment within 30 days of the clinic receiving the referral. The proportion of category 1 patients who waited more than 30 days for their first appointment decreased during the Intervention period from 43.5% to 28.6%, χ^2 ($p< 0.00001$). The percentage of patients who waited longer than 30 days is shown in Figure 5.12.

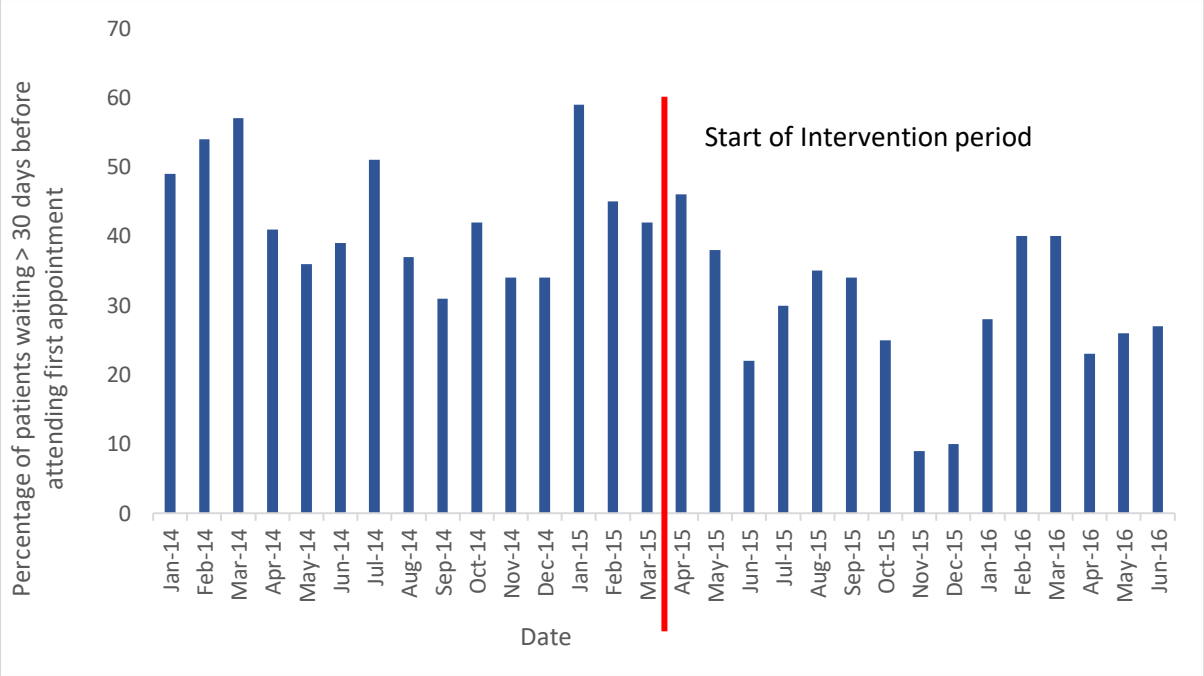


Figure 5.12 Percentage of category 1 patients waiting longer than 30 days before attending the first appointment

The 90th percentile wait time also decreased during the study, from 74.2 days Pre-study to 48.3 days during the Intervention (p=0.00008, Mann-Whitney). In contrast the median wait time remained low and steady throughout the study (8 vs 6 days), which indicates the number of long-waiters decreased during the Intervention period, as shown graphically in Figure 5.13.

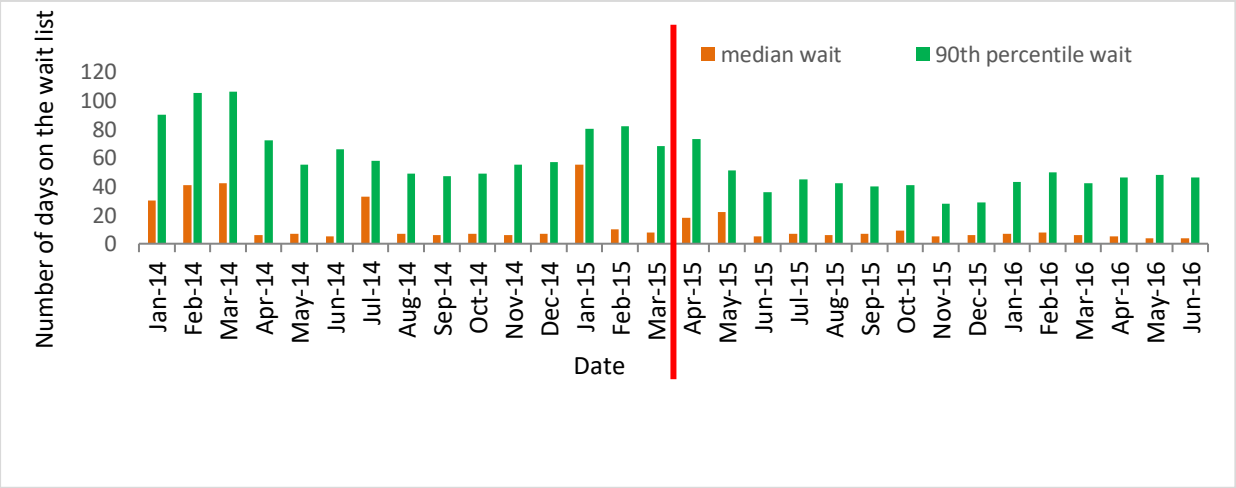


Figure 5.13 Median and 90th percentile wait times for category 1 patients per month

5.3.4.2 Category 2 patients waiting time analysis

The target for category 2 patients was to attend the first appointment within 90 days of the clinic receiving the referral. The percentage of patients who waited longer than 90 days before attending the first appointment remained steady at 97.4% (Pre-study) and 96.4% (Intervention) (χ^2 p=0.4), as shown in Figure 5.14. The Pre-study median wait time was consistently longer than 500 days, which was 5.5 times longer than the clinically recommended waiting time. The median and the 90th percentile wait times were very similar indicating the spread of wait times was not large and with very few outliers, as shown in Figure 5.15.

The median wait time decreased slowly but gradually during the Intervention period, signifying that the patients were given an appointment in the order they appeared on the wait list. If there had been a sudden large decrease in the median wait time, this could signify that patients were "cherry-picked" from the wait list to increase the proportion of patients not waiting more than 90 days before attending their first appointment. The median waiting time decreased significantly between the Pre-study and Intervention periods (560 and 405 days, p <0.0001, Mann-Whitney). This demonstrates the slow but steady decrease in the wait times of the triage category 2 patients.

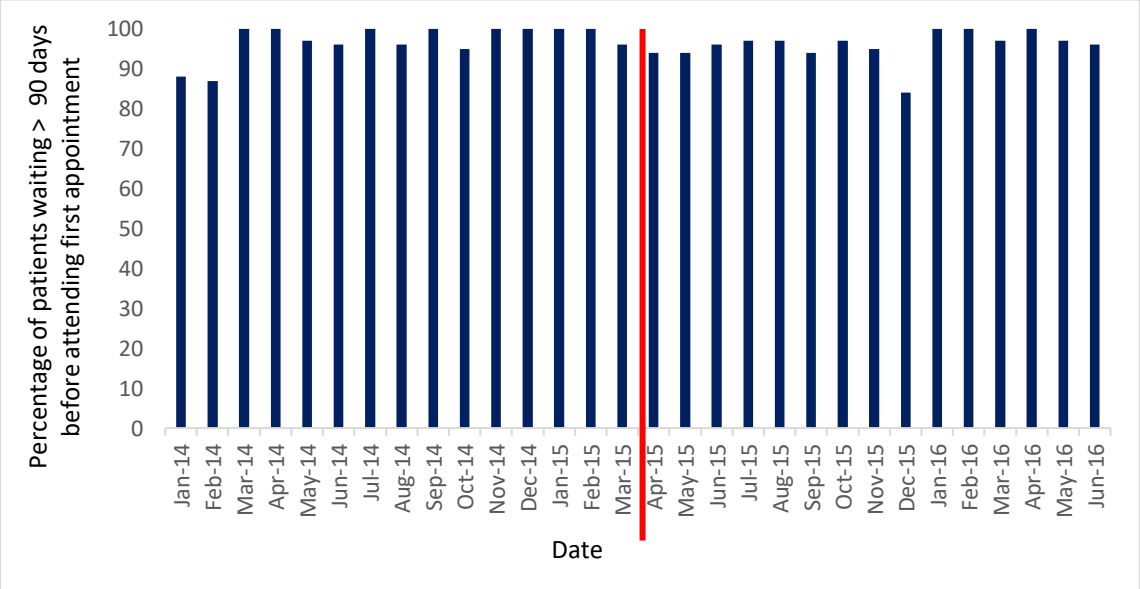


Figure 5.14 Percentage of category 2 patients waiting longer than 90 days before attending the first appointment

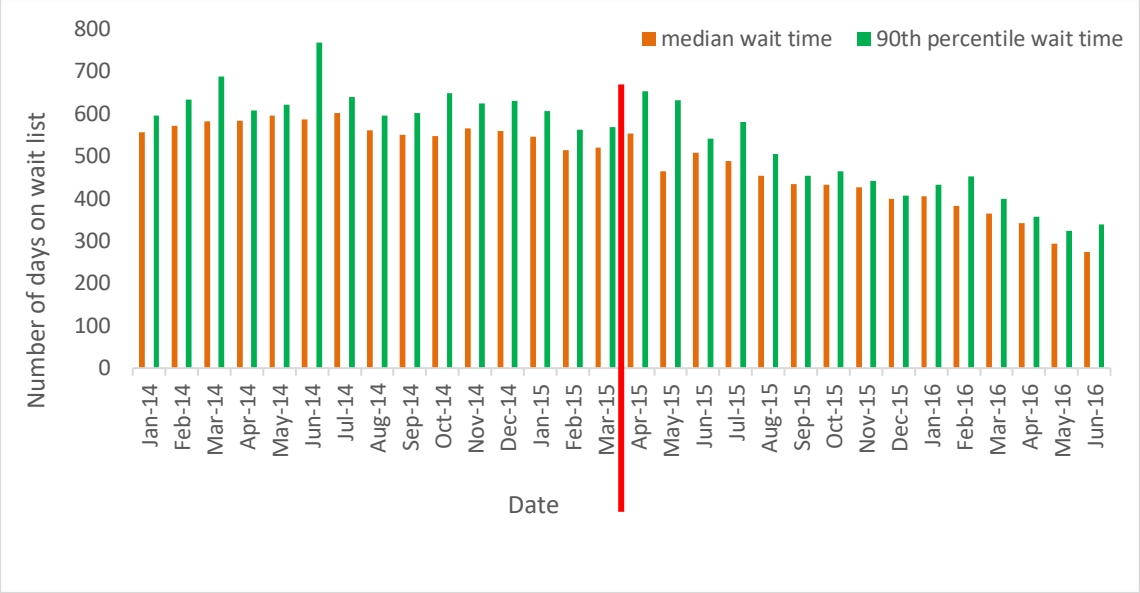
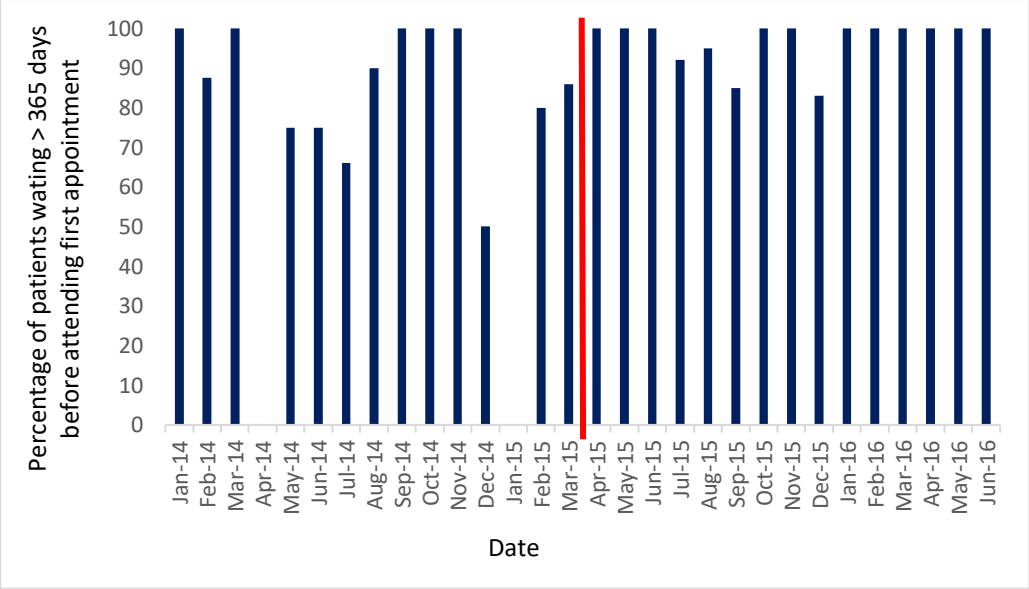


Figure 5.15 Median and 90th percentile wait times for category 2 patients per month

5.3.4.3 Category 3 patients waiting time analysis

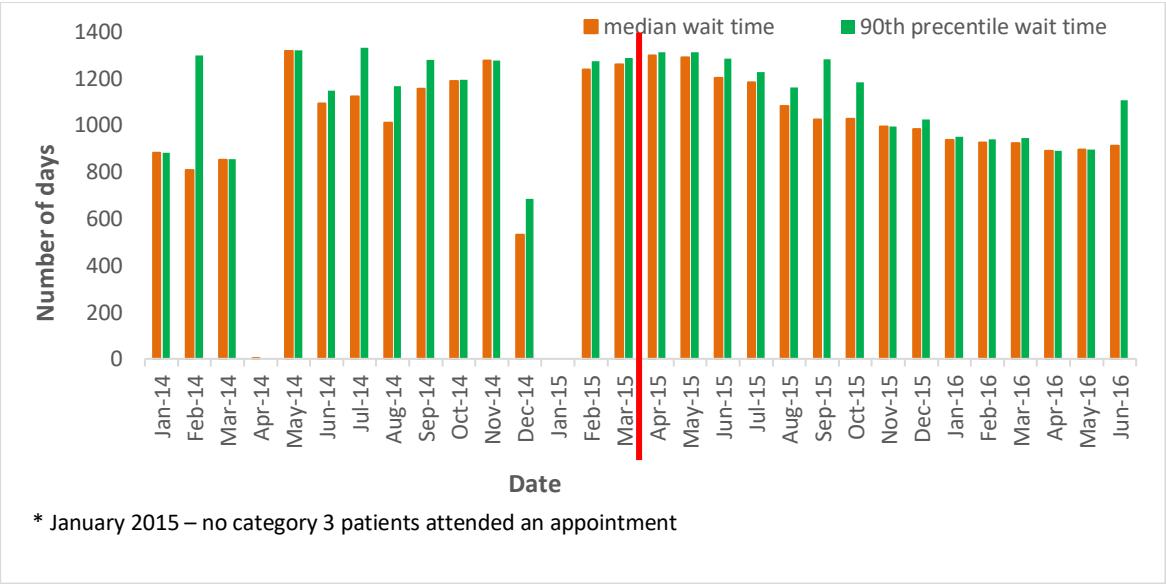
The target for category 3 patients was to attend the first appointment within 365 days of the clinic receiving the referral. The percentage of category 3 patients who waited longer than the target of 365 days before attending their first appointment also remained steady; 91.2% (Pre-study) and 92.9% (Intervention), (χ^2 p = 0.7), as shown in Figure 5.16. The number of patients added to and who *Attended* appointments from the wait list was small compared with the other two categories (only 70 patients *Attended* an appointment during the Intervention period).



* no category 3 patients attended an appointment in January 2015

Figure 5.16 Percentage of category 3 patients waiting longer than 365 days before attending the first appointment

Similar to category 2 patients, the median wait time was well above the target wait and the median and 90th percentile waiting times were very similar (Figure 5.17). The monthly waiting time decreased from the Pre-study period (median = 1112.5 days) to Intervention period (median = 1038 days). Although this result was not statistically significant (p=0.3), it could be argued this result was clinically significant. At the current rate (declining at approximately 27 patients per month and with a median wait time of 910 days in June 2016) it was predicted to take approximately 20 months for the median waiting time to decrease to the target wait time of 365 days.



* January 2015 – no category 3 patients attended an appointment

Figure 5.17 Median and 90th percentile wait times for category 3 patients per month

As the proportion of category 1 patients who waited longer than 30 days before attending an appointment statistically decreased, and the median wait times for category 2 and 3 patients were gradually decreasing, this suggested an increase in patient flow through the outpatient clinic system. Referring to the visual representation of increased patient flow (Figure 5.18), it was previously shown that the reduced number of patients on the outpatient wait list was not caused by either an audit during the Intervention period or a decrease in the number of referrals accepted (2412 vs 2417). The referral criteria also did not change during the study. As there were 101 more surgeries during the Intervention period, this was not part of the explanation for the decrease in the number of patients on the outpatient wait list.

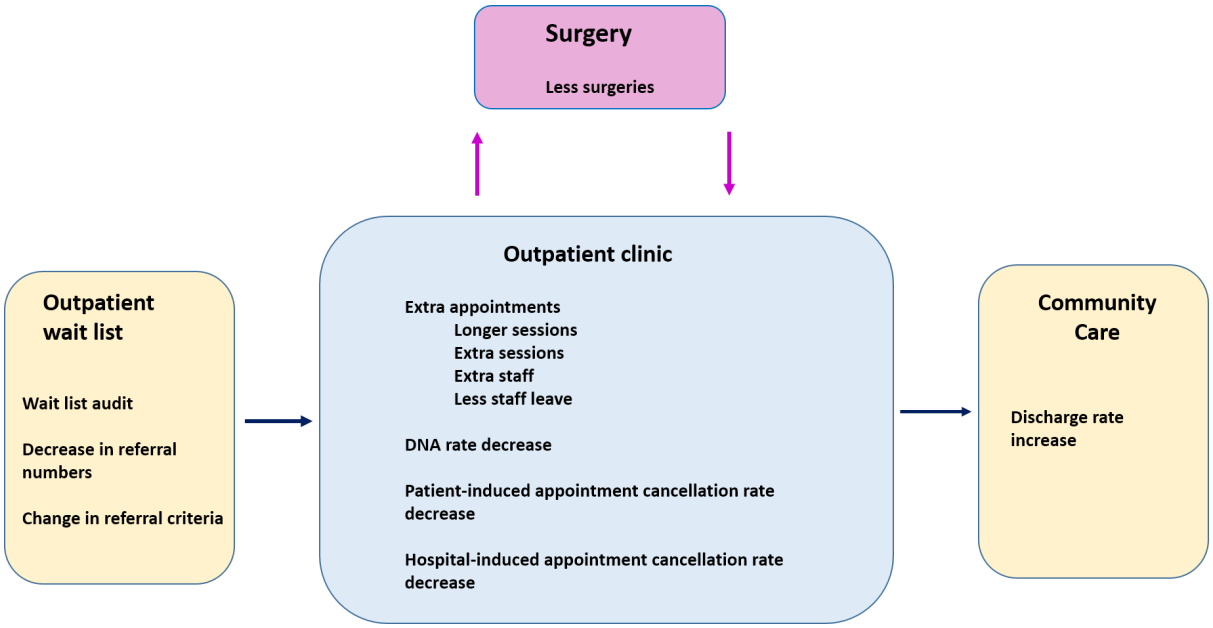


Figure 5.18 Possible explanations for increased patient flow through the Plastic Surgery Outpatient clinic system

The subsequent analyses investigate the number of clinic attendances to assess if extra appointments, a DNA rate decrease, an appointment cancellation rate decrease, or an increased discharge rate contributed to the increase in patient flow through the clinic system. Figure 5.18 was developed as a visual demonstration of increased patient flow in consultation with the staff of both outpatient clinics, in collaboration with the HSI data analysts.

5.3.5 Appointments attended

The previous results focussed on *New* and *Emergency* appointment figures (from the wait list). *Review* appointments will now be analysed. *Review* patients attended the clinic due to a post-surgery follow-up appointment, or later as a planned follow-up appointment (e.g. regular six-monthly appointment for skin cancers). Patients who were admitted to hospital via the Emergency Department (ED) for emergency surgery bypassed the outpatient wait list as per Figure 5.19. These patients attend clinic as a *Review* (post-surgery) appointment.

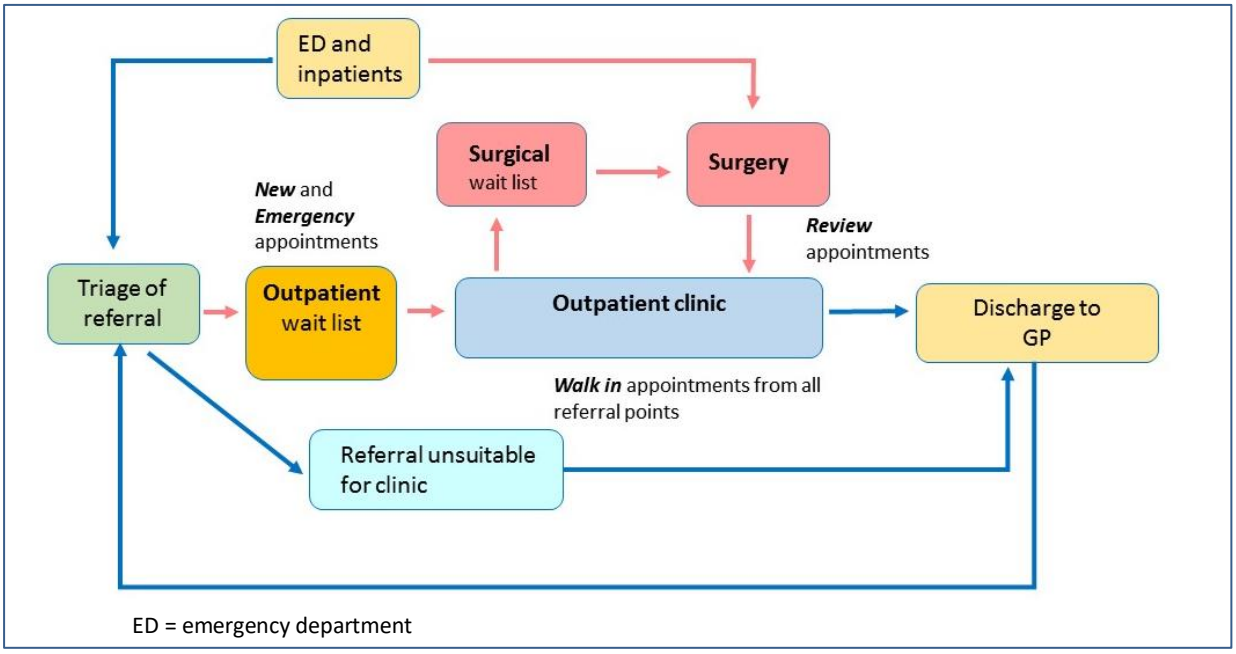


Figure 5.19 Patient movement through the Plastic Surgery Outpatient clinic

There were 7670 *Attended* appointments during the Pre-study period and 8168 *Attended* appointments during the Intervention period (Table 5-9). This was a 6.5% increase in the number of appointments *Attended*. Tuesdays was the busiest clinic day as appointments were rostered all day, followed by Thursdays (afternoon sessions only). The remaining weekdays contained a small number of appointments. *Review* appointments were the largest appointment type by number, followed by *New*, *Emergency,* and then *Walk-in.* There was only one *Telephone consult* across the study period – in the Intervention period.

Table 5-9 Plastic Surgery Outpatient clinic* Attended *appointments by day of the week

***Attended* appointments by day of the week**												
Type	**Mon**		**Tues**		**Wed**		**Thu**		**Fri**		**Totals**	
	Pre	**Post**	**Pre**	**Post**	**Pre**	**Post**	**Pre**	**Post**	**Pre**	**Post**	**Pre**	**Post**
Emergency			505	527			152	191			**657**	**718**
New	26		958	1252			298	272	12	1	**1294**	**1525**
Review	10	42	2924	3204		15	2526	2411	206	141	**5666**	**5813**
Walk-in			34	64			19	47			**53**	**111**
Telephone				1								**1**
Total	36	42	4421	5048		15	2995	2921	218	142	**7670**	**8168**

Post = Intervention period

The increased number of appointments during the Intervention was despite the Pre-study period having more clinic days (187 vs 182) and more clinic Tuesdays (63 vs 62). The largest increase in the number of appointments *Attended* was on Tuesdays (14%), and there was a decrease in the number of appointments *Attended* on Thursdays (-4%).

After discussions with the Working Group, longer clinic sessions (with additional appointments) and extra medical staff were ruled out as the cause of the increased number of *Attended* appointments. The number of *Review* appointments were expected to increase on Tuesdays during the Intervention due to the eight potential additional appointments each week created through the nurse-led clinic. Of the extra 280 *Review* appointments *Attended*, 93 could be attributed to the nurse-led clinic.

The next phase of the analysis was to rule out rostering changes (less staff leave) on Tuesdays as the reason for the additional number of *Attended* appointments. Clinic attendance figures were analysed for each clinician. It was assumed that the number of registrars working in both study periods were equal. The consultant working rosters were unavailable, but by examining the patient attendance figures (for each consultant) daily, periods of leave could be identified, and these are noted in Table 5-10.

Table 5-10 Comparison of* Attended *appointments on Tuesdays

Clinic	Pre-study appointments *Attended*	Intervention appointments *Attended*	Notes
Ad hoc clinics (special purpose) All consultants	**111** 17 New 94 Review	**163** 28 New 135 Review	*Not on the regular clinic roster
Hand Registrar clinic (pm)	**1420** 98 New 1322 Review	**1482** 76 New 1406 Review	
Consultant A clinic (pm)	**202** 143 New 59 Review	**205** 166 New 39 Review	
Plastics Registrar clinic (pm)	**1098** 30 New 1068 Review	**1220** 24 New 1196 Review	
Consultant B clinic pm	**23** 21 New 2 Review	**158** 125 New 33 Review	This clinic was moved from Mondays in January 2015
Nurse-led clinic	**0** 0 0	**93** 3 walk in 90 Review	Began in June 2015
Registrar + Consultant am clinic	**785** 536 New 249 Review	**884** 680 New 204 Review	
Consultant C am clinic	**134** 62 New 72 Review	**206** 136 New 70 Review	**Doctor on leave during Pre-study
Consultant A am clinic	**232** 205 New 27 Review	**243** 224 New 19 Review	***Additional clinics in June 2015
Consultant D am clinic	**219** 215 New 4 Review	**203** 198 New 5 Review	
Consultant B am clinic	**197** 170 New 27 Review	**191** 183 New 8 Review	

Ad hoc clinics were special purpose clinics and were only rostered on an as-needed basis. After examining Table 5-10, staff rostering changes contributed to approximately 104 out of 316 additional *Attended New* appointments during the Intervention, as per the following:

- 11 from the Ad Hoc clinics; *
- 74 from Consultant C being on leave during the Pre-study period,** and
- 19 from additional Consultant A appointments rostered during the Intervention period.***

The following sections investigate if a decreased DNA rate, an increased discharge rate or fewer appointment cancellations also contributed to the number of *Attended* appointments and, in turn, an increase in patient flow.

5.3.6 Did Not Attend rate

The overall Pre-study Plastic Surgery Outpatient clinic DNA rate was 13.7%, but the DNA rate varied with the type of appointment. *Review* appointments were the appointment type with the lowest DNA rate (11.8%), followed by *Emergency* (12.2%), and *New* appointments (22.1%). An example of a clinic with a known low DNA rate was the Procedure clinic (removal of skin cancers, 2.4% Pre-study DNA) and it is included as a comparator. The nurse-led clinic (beginning in June 2015) also had a low DNA rate of 5.1%.

There were three specific interventions aimed at improving the DNA rate:

- implementation and enforcement of a DNA policy;
- allocation of post-surgical *Review* appointments on discharge instead of notification by post; and
- the new "Guidelines for Plastic Surgery follow-up appointments" for junior medical staff.

There was a significant decrease in the *Review* DNA rate (11.8% to 10.4 %, p=0.01), with the largest improvement occurring in the hand clinic on Tuesday afternoons (17.0% to 11.8%, p=0.0005) (Table 5-11). Even though the general plastics clinic was rostered immediately following the hand clinic on Tuesdays and Thursday afternoons (with identical staff present), the higher DNA rate for the hand clinic complements the physiotherapy and nursing staff observation that hand patients have a disproportionate number of unnecessary follow-up appointments and possibly self-discharge (DNA) as a result.

Table 5-11 DNA rates for various Plastic Surgery clinic appointment types

Appointment type	Pre-study (number of appointments)			Intervention (number of appointments)			p-value for difference (chi-square)
	Attended	**DNA**		***Attended***	**DNA**		
All	**7670**	1217	(13.7%)	**8168**	1193	(12.7%)	0.06
New	**1294**	369	(22.1%)	**1525**	425	(21.8%)	0.80
Emergency	**657**	91	(12.2%)	**718**	93	(11.5%)	0.67
Review (total)	**5666**	757	(11.8%)	**5813**	675	(10.4%)	0.012
***Hand Review (total)**	**2574**	477	(15.6%)	**2948**	466	(13.1%)	0.02
Hand *Review* (Tues)	1322	271	(17.0%)	1406	191	(11.8%)	0.00005
Hand *Review* (Thurs)	1252	206	(14.1%)	1542	255	(12.7%)	0.02
***Plastics Review (total)**	**2308**	191	(7.6%)	**2379**	198	(7.7%)	0.96
Plastics *Review* (Tues)	1068	97	(8.3%)	1220	76	(5.9%)	0.02
Plastics *Review* (Thurs)	1240	94	(7.0%)	1159	122	(9.5%)	0.02 (↑)
Nurse-led clinic	-		-	**93**		5 (5.1%)	
Procedure clinic	**208**		4 (2.4%)	**142**		9 (6.0%)	0.04

*Total of Hand and Plastics *Review* do not add up to *Review (total)* because a small number of *Review* appointments were conducted on other days

5.3.7 Discharge rate

One of the redesign initiatives was to discharge patients who did not attend their *Review* appointment. On analysing the supplied hospital data, there were no known discharges due to this policy change.

Review appointments accounted for 85% of all discharges. There was a perception amongst senior nursing and physiotherapy staff that patients were not attending appointments they deemed as unnecessary. The new "Guidelines for Plastic Surgery follow-up appointments" were aimed at decreasing unnecessary post-surgery follow-up appointments, especially in the *Review* registrar hand clinic.

As part of the data authentication process, the raw data was inspected for completeness. The field which contained the discharge information was at times left incomplete. In this instance the data was presented as 'Discharge status unknown'. The extent of the missing data is show in Table 5-12, where up to 10% of the outcome of the appointments were unknown.

In absolute terms there was a modest (but significant with the large sample size) improvement in the discharge rates of all *Review* appointments (24.7% vs 26.6%, p=0.001). There was improvement across

all the major clinics during the Intervention period, except the *Review* Plastics clinic (Tuesday), where the discharge rate remained steady (26.4% vs 24.7%), p=0.7. This example illustrates the importance of complete data to make accurate conclusions due to an intervention.

Table 5-12 Discharge rates for Plastic Surgery clinic* Review *appointments

	All *Review* appointments*		***Review* Tuesday Hand**		***Review* Thursday Hand**		***Review* Tuesday Plastics**		***Review* Thursday Plastics**	
	Pre	**Post**	**Pre**	**Post**	**Pre**	**Post**	**Pre**	**Post**	**Pre**	**Post**
***Attended* appts**	5666	5813	1322	1406	1252	1293	1068	1195	1240	1104
Discharged appts	1401 (24.7%)	1546 (26.6%)	346 (26.2%)	433 (30.8%)	342 (27.3%)	397 (30.7%)	282 (26.4%)	295 (24.7%)	331 (26.7%)	350 (31.7%)
Not discharged	3891 (68.7%)	3731 (64.2%)	900 (68.1%)	864 (60.2%)	841 (67.2%)	794 (61.4%)	719 (67.3%)	781 (65.4%)	813 (65.6%)	662 (60.0%)
Discharge status unknown	374 (6.6%)	536 (9.2%)	76 (5.7%)	109 (7.8%)	69 (5.5%)	102 (7.9%)	67 (6.3%)	119 (10.0%)	96 (7.7%)	92 (8.3%)
p-value for difference (chi-square test) **	0.001		0.002		0.02		0.7 ↓		0.005	

** Chi-square test was performed using a 2x2 table of Discharged appts and Not discharged
*Total of Hand and Plastics *Review* do not add up to All Review appointments
Post=Intervention period

5.3.8 Appointment cancellation rates

The overall aim of the redesign program was to maximise the number of existing appointments available. There were several initiatives introduced to reduce the number of hospital and patient appointment cancellations, especially those at short notice which resulted in wasted appointments which could not be filled. Notifying post-operative patients of their appointment date on discharge was anticipated to decrease the number of short-notice patient cancellations. The "Orientation to Plastics clinic for clinicians" guideline contained a reminder for junior medical staff to notify the clinic at least 8 weeks in advance of planned leave (the clinic staff were only supplied with the leave roster of the consultant doctors). Clinics were commonly cancelled at short-notice during the Pre-study period when registrars omitted to notify the clerks in advance of planned leave.

For the purposes of the redesign program, the HSI data analysts combined both the cancelled (appointments cancelled and not rescheduled) and rescheduled appointments (appointments cancelled and then rescheduled) into one value which was reported to each Working Group. The RHH

previously collected only cancelled appointment data. The reason for combining the data was to quantify the amount of waste produced by both rescheduled and cancelled appointments. The term "cancellations" henceforth refers to a combination of the two data sets.

The clinicians were interested in the numbers of appointments cancelled by the hospital (e.g. short-notice of staff leave or staff illness) and by patients (e.g. patients cancelling on the day of the appointment) and to explore potential solutions. The staff requested the cancellations be divided into 2 groups - less than 3 weeks and between 3 and 6 weeks prior to clinic day. Figure 5.20 is an example of how the monthly data was presented to the Working Groups.

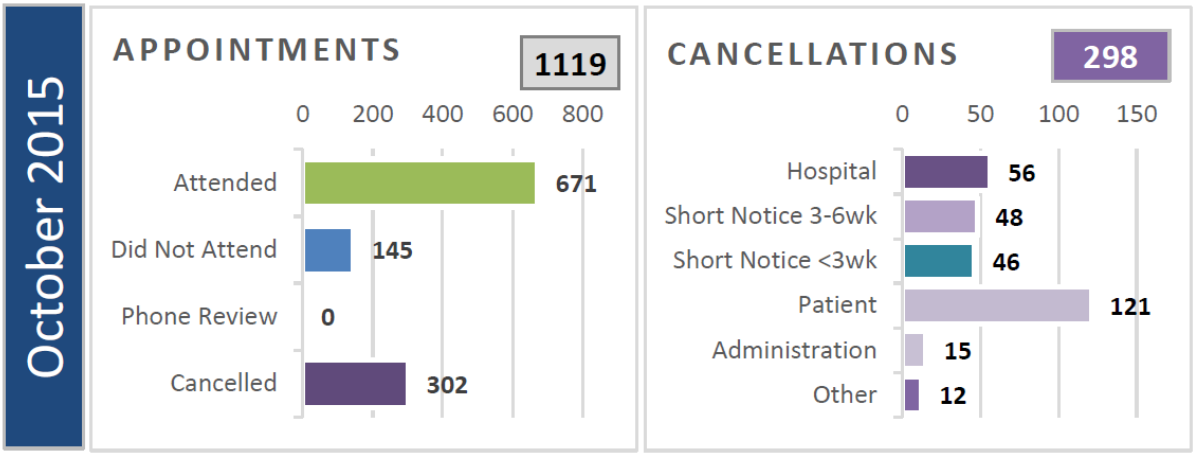


Figure 5.20 The presentation of appointment cancellations to the Working Groups each month

As with all the other gauges of improved patient flow, data integrity was paramount for the accurate measurement of the changes. During data analysis, it became clear that there was an inconsistency in the procedure for cancelling appointments. Appointments were manually cancelled and there were two independent pre-populated fields; *Cancelled by and Cancelled reason.* The choices in the *Cancelled by* category were *Administration, Hospital, Not specified (*unknown*), Patient* and *Carer* or the field could be left blank. The *Administration* category was created for reasons such as *appointment created in error*, and the *Hospital* category was for clinic-related cancellations e.g. *clinician-cancelled patient*. An audit was conducted on all the *Cancelled* appointments during the Intervention period to assess if the data was 'clean' enough to be used to calculate appointment

cancellation rates. There was an obvious inconsistency regarding the difference between an appointment *Cancelled by Administration* and *Cancelled by the Hospital* (Table 5-13).

Table 5-13 An audit of all* Cancelled *appointments during the Intervention period

	Cancelled by:						
Cancelled reason:	**Administration**	**Hospital**	**Not specified**	**Patient**	**Carer**	**(field left blank)**	**Total**
Administration	3	3					**6**
Appointment no longer required	3	19	1	301	1		**325**
Clinician cancelled patient		10		1	2		**13**
Created in error	10	20	1	1			**32**
Deceased			7				**7**
Earlier booking made	6	7	2	9	1	25	
Not specified			37				**37**
Other	1	7	1	43			**52**
Over-riding emergency		2	1				**3**
Patient - Convenience		5	1	188	1		**195**
Patient is inpatient		16		10			**26**
Patient – Medical Condition				12			**12**
Patient – Non-Compliant				1			**1**
Patient Date/Time Unsuitable				26			**26**
Patient incorrectly booked				1			**1**
Transferred to another Wait list		1					**12**
(field left blank)	2	7	1302	92	3	10	**1416**
Total	**25**	**97**	**1353**	**685**	**8**	**10**	**2178**

The *Cancelled by* field was entered as *Not specified* in 62% of all the cancellations during the Intervention period. There were 16 choices in the *Cancelled reason* field, which was onerous for the booking clerks. The fields of *Patient incorrectly booked* and *Created in error* could be merged into one field, as could *Patient Time/Date unsuitable* and *Patient convenience.*

In consultation with the HSI data analysts it was decided not to analyse the cancellation data in any further depth as any conclusions made from this data would almost certainly be incorrect. The business rules for appointment cancellations were not established prior to the study as the appointment data had previously never been examined to this extent by the hospital.

As a proxy measure of waste, the ratio of *Attended* to *Cancelled* appointments was calculated and compared between the two periods. For every 3.1 appointments *Attended* during the Pre-study period, one appointment was *Cancelled*. This increased to 3.8 appointments *Attended* for every appointment *Cancelled* during the Intervention period. This change equates to a significant reduction in waste of both patient and hospital time (χ^2, $p < 0.00001$).

The information provided to the Working Groups in the dashboard format was intended as an evolving prototype. As the hospital staff began to utilise the data to inform changes to work practises, the format of the dashboard was adjusted to each Working Group's specific requirements, e.g. The Ophthalmology Working Group requested that paediatric patients have a separate wait list displayed on the dashboard. After the staff became familiar with the differences between cancellation and rescheduled appointments, the next step in the evolution of the dashboard was to display them as separate metrics. The proposal from HSI was to educate the hospital data analysts on the algorithm used to create the dashboard and to provide documentation and samples of the current product. Due to a misunderstanding of the methodology, a lack of internal resources and a perceived dearth of clinician demand, this level of data analysis became a low priority for the hospital and was placed on hold.

5.3.9 Overdue follow-up appointments

The number of overdue follow-up appointments as an outcome measure was not part of the initial study plan, as it was not a recognised element of patient flow through the clinic system. It was the Ophthalmology Working Group members who alerted the clinical redesign project officer of the unintended outcome of overdue follow-up appointments. Given that each clinic had a finite number

of appointments, there was a balance between allocating appointments to patients from the wait list, post-operative appointments and patients who were due follow-up appointments (e.g. 6-monthly appointments). This information provided a further explanation for the decrease in the number of patients on the outpatient wait list, as shown in Figure 5.21 (an updated version of Figure 5.5). If appointments are prioritised for patients on the outpatient wait list and patients who require timely post-surgical appointments, then there is a risk of delaying patients who require longer term follow-up appointments, and this increases the number of people who are overdue a follow-up appointment. In September 2015, the number of overdue follow-up appointments was first reported by HSI on request from the Ophthalmology Working Group.

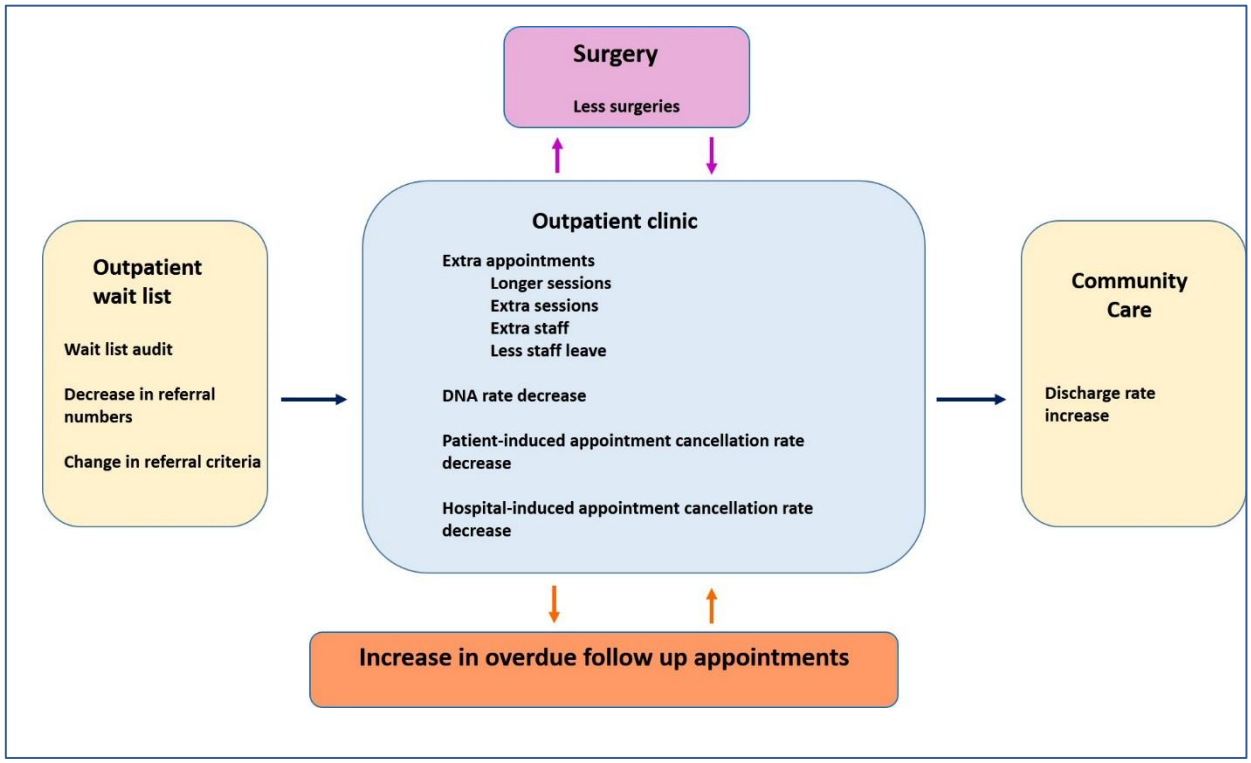


Figure 5.21 Possible explanation for an increase in patient flow through the Plastic Surgery Outpatient clinic system (updated)

After September 2015, overdue appointment figures were downloaded from the iPM™ patient management system on three further census dates and provided to the clinics (appointments more than 2 years overdue were not included). Even though the clinical redesign program was completed in June 2016, the Working Groups requested and were supplied a report on the number of overdue follow-up appointments in November 2016.

To determine if there may be a relationship between the number of patients on the outpatient wait list and the number of patients who were overdue a follow-up appointment, the data was graphed (Figure 5.22). As the number of patients on the wait list decreased, the numbers of patients overdue for a follow-up appointment increased. It was documented in the researcher's diary that the Plastic Surgery Working Group were concerned that this was an unintended consequence of focussing on decreasing the wait list numbers and not allocating enough appointments for follow-up patients. The overall number of *Review* appointment attendances did increase in the Intervention period by 147, but there was also extra burden of an additional 102 surgeries (compared with Pre-study), and each of these patients required at least one follow-up appointment. It was the policy of the clinic that post-surgical appointments were given priority over the longer-term follow-up appointments.

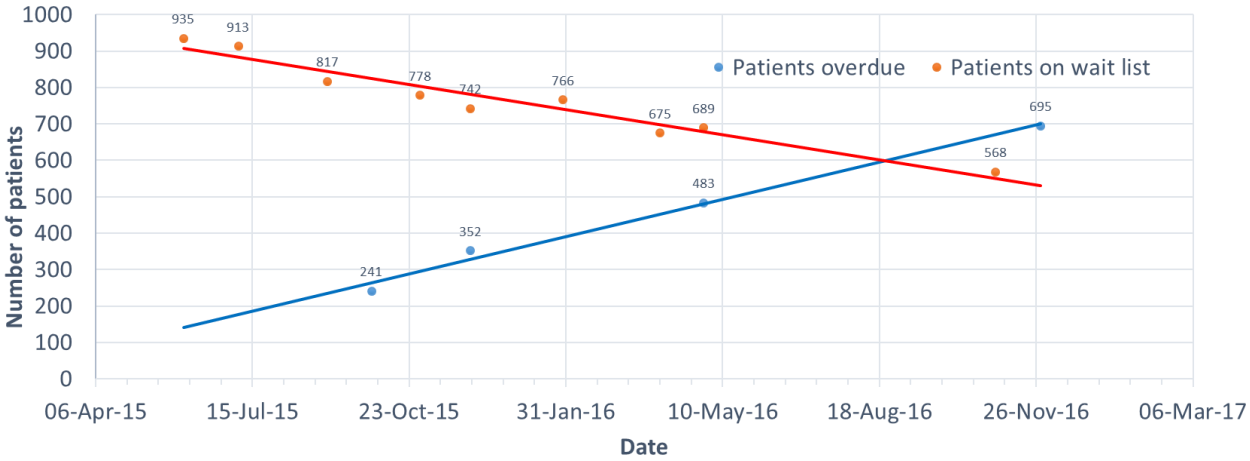


Figure 5.22 The Plastic Surgery Outpatient clinic wait list for an initial appointment compared with numbers of patients overdue for a follow-up appointment

Given that the overdue follow-up appointment data was extracted directly from the iPM™ system, an audit was performed to check the accuracy of this figure on the chosen census date of 29/09/2015. The unique patient identifiers for the patients who were overdue were matched against all appointments during the Intervention period (*Attended, Cancelled and DNA*). Of the 241 patients on the overdue list on 29/09/2015, 206 (85.5%) patients were actually overdue their appointment. The reasons for the appointment incorrectly categorised as overdue are displayed in Table 5-14.

Table 5-14 Audit of follow-up appointments incorrectly categorised as overdue

Reason follow-up appointment not overdue	Number of patients
Appointment *Attended* on another date	12
Patient deceased	6
Patient cancelled appointment, and another not rescheduled	5
Patient discharged	7
Duplicate entry	1
Patient cancelled appointment and re-booked another	4
Total	**35**

Despite an overestimation of the number of patients whose appointment was overdue, the Working Group was probably correct in their belief that too much emphasis had been placed on allocating appointments to patients on the Plastic Surgery Outpatient clinic wait list. The additional *Review* appointments as a result of the extra 102 operations during the Intervention period may also have displaced patients who were overdue for their follow-up appointment. It was possibly a combination of additional patients from the wait list and the extra surgical cases which caused the overdue appointment numbers to increase.

Even in an outpatient clinic system where the number of accepted referrals remained constant throughout the entire 30-month study period, patient flow proved difficult to quantify. The inability to calculate an accurate appointment cancellation and discharge rate further added to this problem. The following section assembles the results with a summary of the main changes completed by the Plastic Surgery Working Group.

5.4 Patient survey results

The return rate for the Plastic Surgery Outpatient clinic patient surveys was 46/103 (45%) Pre-study and 53/99 (54%) for the Post-intervention period. The results are assembled in Table 5-15. There were no statistically significant differences in the responses using the Chi-Square Test of Independence between the Pre-study and Post-Intervention periods. The gender ratio, median age and age range were similar for both study periods.

Table 5-15 Survey results: Plastic surgery patient satisfaction

	Pre (n=46)		**Post** (n=53)	
Male	22	(48%)	30	(57%)
Median age	59		58	
Age range	10-82		5-88	
Q2. Have you ever visited this Outpatient clinic before?				
Yes	33	(72%)	37	(70%)
Q3. If Yes, was it for the same condition?				
Yes	29	(88%)	33	(89%)
Q4. How long did you wait for your first visit?				
Less than 1 month	36	(78%)	32	(60%)
1 month to 6 weeks	6	(13%)	8	(14%)
Between 6 weeks and 3 months	2	(4%)	3	(6%)
Between 3 and 5 months	1	(2%)	1	(2%)
More than 5 months but no more than 12 months			1	(2%)
Between 12 and 18 months	1	(2%)	1	(2%)
Don't know can't remember			3	(6%)
I didn't have an appointment			2	(4%)
(blank)			1	(2%)
Q5. Do you think the amount of time you waited was?				
About right	39	(85%)	40	(75%)
Slightly too long	3	(6%)	9	(17%)
Much too long	4	(9%)	3	(6%)
Q6 Did your symptoms get worse while you were waiting?				
Yes, definitely	3	(7%)	8	(15%)
Yes, to some extent	7	(15%)	9	(17%)
No	33	(72%)	35	(66%)
Don't know/can't remember	3	(6%)	1	(2%)
Q7. Were you given an appointment time or were you able to choose one?				
I was given an appointment time and I accepted it	42	(91%)	45	(85%)
I was given an appointment time and I changed it	1	(2%)	2	(4%)
I choose the appointment time myself	3	(6%)	6	(11%)
Don't know can't remember				
Q8. Were you able to get an appointment time that suited you?				
Yes	41	(89%)	41	(77%)
No	1	(2%)	9	(17%)
I didn't have an appointment				
(blank)	2	(4%)	3	(6%)
Q9. How long did it take you to travel to the clinic?				
Under 30 minutes	20	(43%)	21	(40%)
Between 30 and 59 minutes	20	(43%)	27	(51%)
1 to 2 hours	5	(11%)	4	(8%)
2-3 hours				
3 hours or more	1	(2%)	1	(2%)
Q10. What was your main form of transport to the clinic?				
Private car - myself driver	22	(48%)	24	(45%)
Private car - friend or relative driver	18	(39%)	22	(42%)
Public transport	3	(6%)	5	(9%)
Taxi	3	(6%)		
Community transport			2	(4%)

Q11. How many staff members did you have contact with?				
2-3	29	(63%)	35	(66%)
4-5	17	(37%)	15	(28%)
6 or more			3	(6%)
Q12. Did you have enough time to discuss your health issues?				
Yes, definitely	37	(80%)	39	(74%)
Yes, to some extent	8	(17%)	12	(23%)
No	1	(2%)	2	(4%)
Q13. Did the health professionals explain things in a way you could understand?				
Yes, always	38	(83%)	38	(72%)
Yes, sometimes	7	(15%)	13	(25%)
No	1	(2%)	2	(4%)
Q14. Did the health professionals know enough about your medical history?				
Yes, definitely	27	(59%)	27	(51%)
Yes, to some extent	15	(33%)	17	(32%)
No	4	(9%)	9	(17%)
Q15. Were you involved as much as you wanted to be in decisions about your treatment?				
Yes, definitely	34	(74%)	34	(64%)
Yes, to some extent	10	(22%)	14	(26%)
No	2	(4%)		
I did not want or need to be involved			5	(9%)
Q16. How would you rate how well the health professionals worked together?				
Very good	24	(52%)	30	(57%)
Good	12	(26%)	14	(26%)
Neither good nor poor	1	(2%)	4	(8%)
Poor	2	(4%)	2	(4%)
Very poor			1	(2%)
Not applicable	7	(15%)	2	(4%)
Q17. Before arriving, did you know the reason for today's appointment?				
Yes, definitely	45	(98%)	49	(92%)
Yes, to some extent	1	(2%)	4	(8%)
Q18. Were you given enough information about how to manage your care at home?				
Yes, completely	33	(72%)	35	(66%)
Yes, to some extent	8	(17%)	10	(19%)
No, not enough information	1	(2%)	3	(6%)
No, I do not need this type of information	4	(9%)	5	(9%)

Q19. Did the health professionals provide you with a treatment plan for ongoing care?				
Yes, given a written plan	4	(9%)	2	(4%)
Yes, given a verbal plan	29	(63%)	32	(60%)
No, but I would have liked one	9	(20%)	12	(23%)
No, I did not need one	4	(9%)	7	(13%)
Q20. How well would you rate the overall care you received in the clinic today?				
Very good	27	(59%)	29	(55%)
Good	14	(30%)	18	(34%)
Neither good nor poor	4	(9%)	3	(6%)
Poor			1	(2%)
Very poor	1	(2%)	1	(2%)
(blank)			1	(2%)
Q21. What is the highest level of education you have completed?				
Still at school	5	(11%)	4	(8%)
Less than year 10	8	(17%)	8	(15%)
Completed year 10	11	(24%)	8	(15%)
completed year 12	5	(11%)	4	(8%)
Trade or technical certificate	10	(22%)	20	(38%)
University degree	7	(15%)	8	(15%)
(blank)			1	(2%)

NB. Not all answers total exactly 100% due to rounding

Most patients had been to the Plastic Surgery Outpatient clinic previously (72%), and 89% of those patients were *Attending* an appointment for the same condition (Pre-study). This finding can be explained by the high number of post-operative appointments in the registrar clinic (where the survey was conducted). When the responses for Q4. were combined into patients waiting 6 weeks or less for an appointment, or more than 6 weeks, there was a statistical difference between the Pre-study and Post-study period (91% vs 74%), χ^2 ($p<0.05$). The reason for the short waiting time for the survey respondents is a combination of the high number of post-operative patients *Attending* the registrar clinic (the Plastic Surgery casemix is 50% trauma patients), and the higher proportion of category 1 referrals to the clinic. The longer waiting time of the respondents in the Post-study period corresponds with the increased number of category 2 patients (median waiting time of over 400 days) *Attending* an appointment from the wait list during this time.

Interestingly, 41 out of 42 patients were able get an appointment time that suited them during the Pre-study period. This also may be because the time spent on the wait list was short and the patients

were in pain and were willing to accept any appointment regardless of the time and date. Alternatively, the time and date of the appointment was chosen face-to-face with the clerical staff during the previous appointment. Questions 12 to 20 specifically investigated the patients' interaction with the clinic staff. Question 14, 'Did the health professionals know enough about your medical history?' had the highest percentage of 'No' responses (9% Pre-study and 17% Post-study, and 33% Pre-study and 24% Post-study answered 'Yes, to some extent'). These answers possibly reflect the lack of continuity due to doctors not being allocated to specific patients (except for Category 1) in the registrar clinics and the doctors walking into the consultation rooms and not knowing the patient's history beforehand. The other area of care in which some patients felt was deficient was (Q.19), where 20% (Pre-study) and 23% (Post-study) of respondents did not receive a treatment plan but would have liked one.

5.5 Summary

The Plastic Surgery Outpatient Working Group chose four main initiatives during the redesign program. Staff flow during clinic sessions was improved by altering the way senior clinicians were able to mentor junior staff and six out of 8 medical staff surveyed responded that this "increased the opportunities for teaching time during clinic". The 'Physio first' mode of care failed to see any patients due to a combination of inadequate staffing and inadequate screening of suitable patients although 76% of the staff agreed that early intervention by a physiotherapist for this select patient group is beneficial. Most staff (95%) were aware of the new nurse-led clinic, but attendance numbers were sporadic possibly because some staff were unsure of the type of patients suitable for this clinic. There were numerous new guidelines written to help standardise clinic processes and procedures, which also included some policies which were introduced to all the RHH outpatient clinics.

Overall, there was a steady decrease in the number of people on the Plastic Surgery Outpatient clinic wait list, which corresponded to an increased number of appointments *Attended* during the Intervention. The percentage of category 1 patients who waited more than 30 days for their first

appointment significantly decreased during the intervention period from 43.5 % to 28.6%. The largest increase in *Attended* appointments was for category 2 patients and even though the waiting time was longer than the clinically recommended 90 days, the median waiting time decreased from 560 to 405 days.

The other measures of patient flow were DNA rate, discharge rate and appointment cancellations. The overall clinic DNA rate did not change significantly (13.7% vs 12.7%). When the data was examined for targeted interventions, there was a significant decrease in the DNA rate of *Review* patients in the registrar hand clinic on Tuesdays (17.0% vs 11.8%)

There was a modest (but statistically significant) improvement in the discharge rate for *Review* appointments (24.7 vs 26.6 %), which may have been higher if the data set was complete. The hospital and patient cancellation rates could not be calculated with any accuracy because of the multiple methods of cancelling appointments by the hospital.

The final measure of patient flow was the number of overdue follow-up appointments. As the number of patients on the outpatient wait list decreased, the number of patients overdue for their follow-up appointment increased (Figure 5.21). The cause was most probably multifactorial as there was an additional 102 surgeries during the Intervention, which each required at least one *Review* appointment as well as the concerted effort to allocate appointments to category 2 patients on the outpatient wait list.

Overall, the biggest change in staff behaviour was due to the opportunity to meet and discuss issues of importance outside the busy clinic environment and the new understanding of patient flow through the outpatient clinic system. Communication regarding the redesign initiatives became noticeably harder for the nursing and physiotherapy staff when a medical representative was not present at the redesign meetings. The importance of reliable raw data underpinned the accurate analysis of redesign activities. Some of the markers of changes to patient flow could not be precisely assessed due to conflicting/missing data.

6 Results: Ophthalmology

This chapter is structured similarly to the Plastic Surgery Results. The redesign initiatives are divided into two themes – patient flow during clinic sessions, and clinic demand and patient access. The results of the staff survey are embedded in the analysis of the activities. The Ophthalmology Outpatient clinic demographics are then described prior to examination of waiting times, DNA rates, discharge rates, cancellation rates and overdue follow-up appointment statistics. The results and subsequent discussion are framed by the main objective of the evaluation stated in Chapter 1:

> *Does the application of clinical redesign improve patient flow through Plastic Surgery and Ophthalmology Outpatient clinics?*

Patient flow was defined by the following measures:

- Percentage of patients who waited longer than the clinically recommended time before attending their first outpatient appointment by triage category
- Median wait time to the first appointment by triage category
- Did Not Attend (DNA) rate
- Discharge rate
- Hospital and patient appointment cancellation rates
- The number of overdue follow-up appointments

6.1 Caseload

The Ophthalmology Outpatient clinic was a busy multidisciplinary clinic which handled 1330 bookings per month and ran sessions on a 4-week rotating cycle i.e. the same clinics were repeated every four weeks. The differences between the same sessions each week was usually only minor – for example, the number of consultant doctors present. The clinic was open five days per week with the morning and afternoon sessions allocated to different sub-specialties such as cataract, macular degeneration and general ophthalmology clinics. Patients were allotted separate appointments on the iPM patient management system for each medical practitioner and allied health staff member they consulted, and patients frequently attended multiple appointments during a single visit. The method of booking the

appointments did not accurately reflect the nursing workload. Patients were usually only specifically booked for a nurse consultation if they attended a nurse-led clinic. Nurses were present during all clinic sessions and performed most of the eye tests and saw most of the patients but did not have a documented appointment on the iPM system.

Prior to the study, the clinic manager had requested funding for an extra clerk to assist with appointment bookings and an allied health assistant to undertake routine eye tests (at the time performed by nurses, orthoptists and optometrists). This was a new position for the RHH, but the role was common in private ophthalmology practices nationally. This allied health assistant commenced employment in January 2016, working on Monday, Thursday and Friday mornings conducting eye examinations. An extra clerical staff member was also employed to receive and depart patients from the clinic. This permitted an experienced clerk to be reassigned to help maximise the booking of appointments. These new positions alleviated pressure on the current staff and made some of the changes harder to attribute to the redesign program.

The analysis of the Ophthalmology clinic raw appointment attendance data provided by the hospital presented challenges due to the following reasons, and each issue will be discussed in further detail in this chapter.

1) The perception from the staff was that demand for their services was increasing and sessions were sometimes overbooked because of the 'availability' of redundant appointment slots for the clerical staff to book appointments. These slots were originally designated for clinics that were no longer in use. In effect, the clinic had more slots 'available' than actual appointments. On investigation, the main type of redundant appointment had the session code of "EYE03". After conferring with the booking clerks, this code was only used when all legitimate appointments allocated to doctors were fully booked. The pressure to allocate appointments to emergency and post-operative patients, and the 'availability' of these slots caused appointment numbers to inflate. The original purpose of the "EYE03" appointment code was

a booking to see the clinic nurse, but this was never corrected in the booking system to reflect the actual health professional conducting the consultation. This resulted in the number of medical appointments during the Pre-study phase being underestimated. All the "EYE03" appointments could not be automatically assigned to the medical staff as some of the appointments were legitimately booked for a nursing consultation. There were 60 "EYE03" appointment slots each week 'available'. It could not be accurately determined how many of these were genuine appointments.

2) After discussions with the booking clerks, it was also uncovered that to quantify the nursing workload during the Pre-study phase, many patients had each individual eye test booked as a separate appointment. This meant that some patients had multiple appointments booked to see a nurse on the same day (some were even booked at the same time). Unfortunately, the same redundant code of "EYE03" was used to book these multiple eye tests. The number of patients and the period over which this practice happened could not be determined.

3) During the Pre-study phase (January 2014 to March 2015) there were three distinct time periods when the approach to triaging the referrals changed. In the first period (January 2014-June 2014) most accepted referrals were triaged as category 3. During the next period (July 2014 to October 2014) most referrals were triaged as category 1. In the final period (November 2014 until the end of the study), the same consultant triaged all referrals (except for leave periods when a senior registrar was allocated the task). This third triaging period resulted in a more even allocation of referrals to categories 1 and 2. This will be discussed

again in Section 6.3.3, when the number of patients attending an appointment from the wait list will be examined in detail.

6.2 Interventions

Identical to the Plastic Surgery Working Group, the project officer collated the list of problems and solutions generated from the Big Picture Map exercise. This document informed the agenda items for the first Working Group redesign meeting and were arranged under the following headings.

- Referral process
- Triage of referral
- Booking an appointment
- Wait list management
- Day of clinic
- Outcome of appointment

The Ophthalmology clinic staff were very engaged in the redesign project and originally had 25 different agenda items to work through after the 2-day workshop. They then added another 12 items during the Intervention period. Fourteen of the 25 initial agenda items, and six of the 12 added agenda items were completed as per the *Ophthalmology Clinical Redesign Working Group Action Plan,* as documented by the clinical redesign project officer by June 2016.

From the problems outlined in the *Ophthalmology Clinical Redesign Working Group Action Plan*, two main themes were identified:

- patient flow during clinic; and
- clinic demand and patient access.

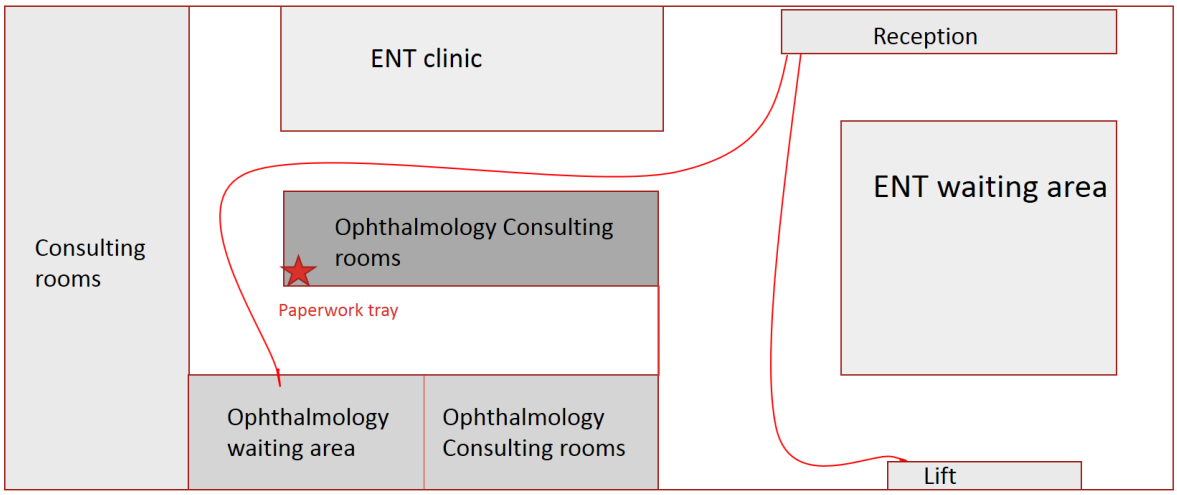
The following section discusses details of these two main themes identified by the staff during the workshop, the subsequent planned solutions and the outcomes implemented as part of the clinical redesign program.

As the details of the new DNA policy were described in Chapter 5 (and were instigated in all outpatient clinics) their implementation will not be reviewed further in this chapter.

6.2.1 Patient flow during clinic

The problems

The fragmented patient flow in the Ophthalmology clinic was a multi-faceted problem exacerbated by the physical layout of the clinic. Patients entered a common foyer area from the lift - which was the combined reception desk for Ophthalmology/Oral and Maxillofacial Surgery (OFM)/Ear, Nose and Throat (ENT) outpatient clinics. The Ophthalmology clinic had the largest number of patients and more clinic sessions than the other two clinics. The clerk registered each patient at the reception desk electronically on the iPM patient management system as *Attending* their appointment. The patient then walked down the corridor to the designated Ophthalmology clinic waiting area, as shown in Figure 6.1.



ENT = Ear, Nose and Throat surgery clinic

Figure 6.1 The Ophthalmology Outpatient clinic layout

Due to the extended distance between the reception area and the consulting rooms, the patients were given their own non-confidential paperwork (patient stickers and a blank outcome form) to carry around to the waiting area. The patient placed the paperwork in a designated tray before being seated (Figure 6.1). The tray was regularly emptied, usually by the nursing staff. This paperwork was then included in each patient's file. It was the role of the nurses to organise the patients to be seen in the order of their appointment time (not arrival time). The nursing staff and medical staff were also able to see which patients had arrived in clinic by looking on the iPM patient management system. The

optometrists and orthoptists did not have training in how to access this section of iPM. These staff members were provided with a printout of the clinic patients and appointment times and were responsible for seeing their own patients at the scheduled time.

Each patient's file was moved between rooms with the patient. After each consultation/test, the patient file was placed on the shelf outside the room of the clinician with whom the patient had the next appointment. When there was more than one file outside the door of a clinic staff member, the last file added was to be placed at the rear of the pile. This was to ensure the patients were seen in the correct order. The patient's file remained with the nurse if the patient was to have multiple tests conducted by the nurse.

At the start of each appointment, the patients were called separately into a consulting room by the nurse for a visual acuity check and the instillation of pupil-dilating eye drops. The patient then returned to the eye clinic waiting area for at least 20 minutes for the eye drops to take effect. As well as performing different eye tests on patients, it was also the role of the nurses to be patient navigators. After each test, the patient returned to the waiting room. There were 13 rooms in which 14 different tests/procedures could take place, and up to seven eye health professionals working during a clinic session. As patients were not allowed to drive after receiving eye drops, and many patients also had reduced vision, the waiting room was frequently occupied with twice as many people as there were patients. This added to the difficulty of managing patient flow through the clinic. The final consultation for each patient was with the registrar or consultant to discuss the outcome of the appointment. At the end of each appointment, the patient received a completed outcome form from the doctor or other eye health professional to return to the reception desk on their way out. This form notified the clerical staff when another appointment was required or if the patient was to be discharged from clinic. Not all the staff completed these forms, and because the patients did not need to walk past the reception desk on their way to the lift, many forms were not handed back. Although

this was thought not to compromise clinical care, the practice may have resulted in incomplete appointment data (and will be discussed later in this chapter).

Compounding the issue of patient flow during a clinic session were the following external factors causing interruptions.

- Poor communication between the clinic and operating theatres (both RHH and private day surgery) resulting in post-operative patients arriving in clinic without bookings on the iPM system.
- Current inpatients (admitted under other specialties) not arriving in clinic at their scheduled appointment time. On occasions patients arrived in a bed and were too unwell to sit up for an eye examination.
- The registrar was commonly contacted directly by doctors in the emergency department and community GP surgeries, and the patients were subsequently told to go direct to the clinic without a booking on the iPM system.
- Phone calls to clinical staff from community optometrists and ophthalmologists requesting detailed patient information, disrupting clinic sessions.

In addition, informal patient feedback was provided to the researcher whilst distributing the patient experience (Pre-study) surveys in the eye clinic waiting room. Respondents mentioned that the survey had failed to ask patient opinion about the length of time spent in the clinic during an appointment. The major criticism was the long periods of time spent in the waiting room between eye tests. This patient feedback was relayed back to the Working Group, and a patient tracking exercise was conducted. The aim was to quantify the waiting times and examine patient flow to locate the cause of any bottlenecks during a clinic session. The waiting time complaints were made during a Monday morning general Ophthalmology clinic.

Patient tracking exercise results

A trial mapping session of the Monday morning clinic was performed, and all but one patient agreed to participate. With one omitted patient, the rooms they occupied, and the professionals consulted (all time stamped) were also missing. The missing data created a gap in the timeline which made the

analysis difficult. Knowing the location of all the patients, staff and the occupancy level of the rooms was required for an adequate assessment of patient flow.

All patients agreed to participate (n=23) in the actual mapping session on Monday morning (19/10/2015). Five patients were seen on time, and two patients were called to their appointment prior their allotted appointment time. The median wait time between the scheduled appointment and the time to enter the first consultation room was 7.5 minutes. One patient had his consultation 230 minutes after the scheduled appointment time. This equated to 94% of the total clinic time spent in the waiting room. This elderly patient did not place the paperwork given to him by the reception staff in the allocated tray, and subsequently the clinical staff did not know he had arrived. He was marked by the reception staff as "*Attending*" the appointment on the booking system but went unnoticed in the waiting room and subsequently fell asleep until he was observed by one of the consultants. There was no signage in clinic for patients to inform a staff member if waiting for longer than 40 minutes (as in most other RHH clinics). As the waiting room was usually full for most of the session, it was hard for the staff to visually track the patients.

Overall, the patients spent a median of 65% (range 27%-94%) of clinic time in the waiting room. This time excluded the mandatory 20 minutes waiting for the eye drops to completely dilate the pupil. After the Working Group reviewed the results, they identified a period of extended unnecessary waiting between the final eye test and the consultation with the doctor (e.g. patient numbers 54, 59, 70 in Figure 6.2).

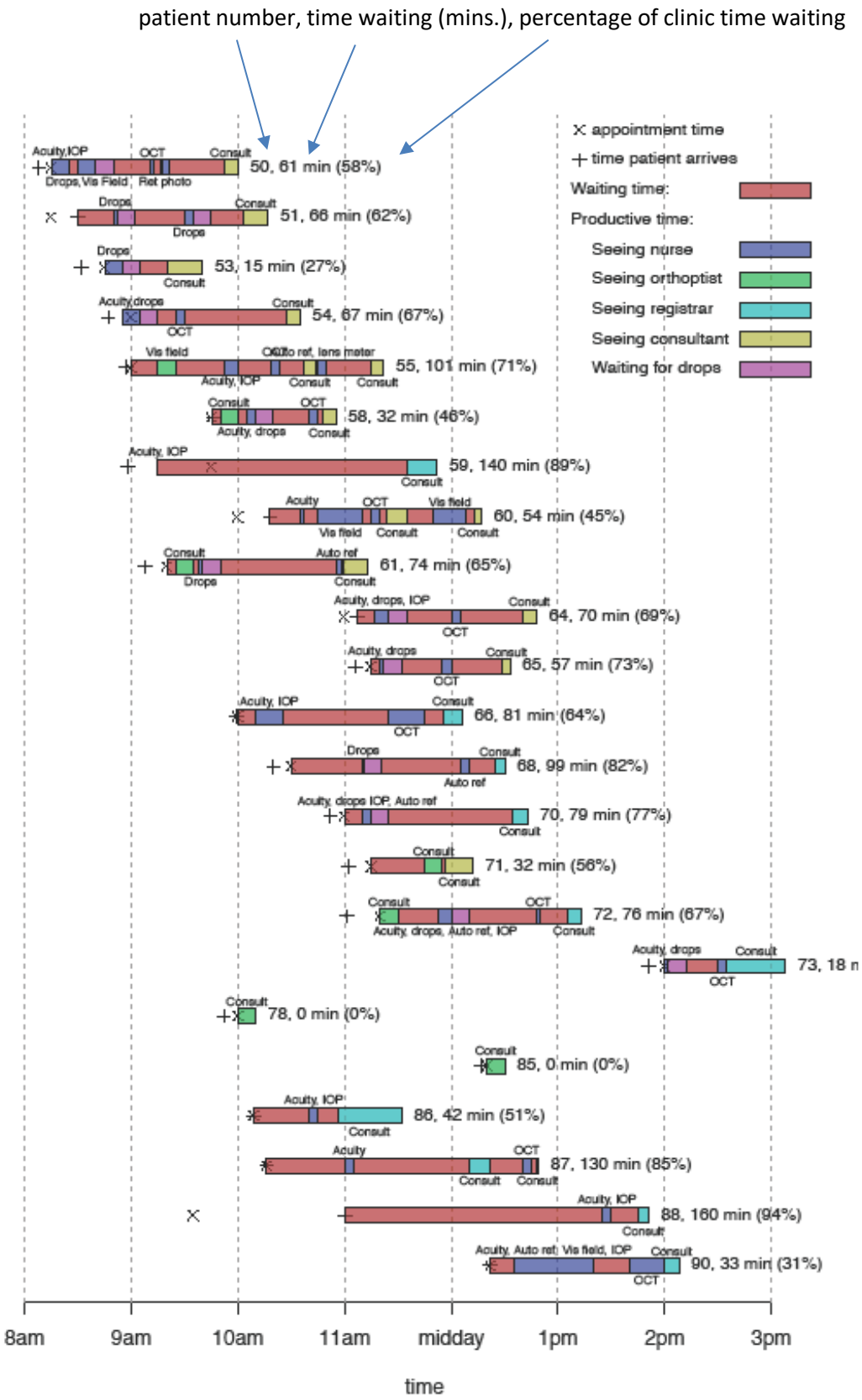


Figure 6.2 Patient waiting times in a Monday morning general Ophthalmology clinic

A second clinic (macular degeneration eye injection clinic) requested to have the same tracking exercise undertaken in their clinic. The mean waiting time of the twelve patients attending was 42%

of the total appointment time (range 23% to 73%). The mean wait time between the actual appointment time and the time to enter the initial consultation room was only 4 minutes and the median was 8 minutes (four patients entered the initial consultation room prior to their allotted appointment time). Overall 14 patients *Attended* the clinic, but two patients had an appointment for another eye condition (patients 9 and 11 in Figure 6.3).

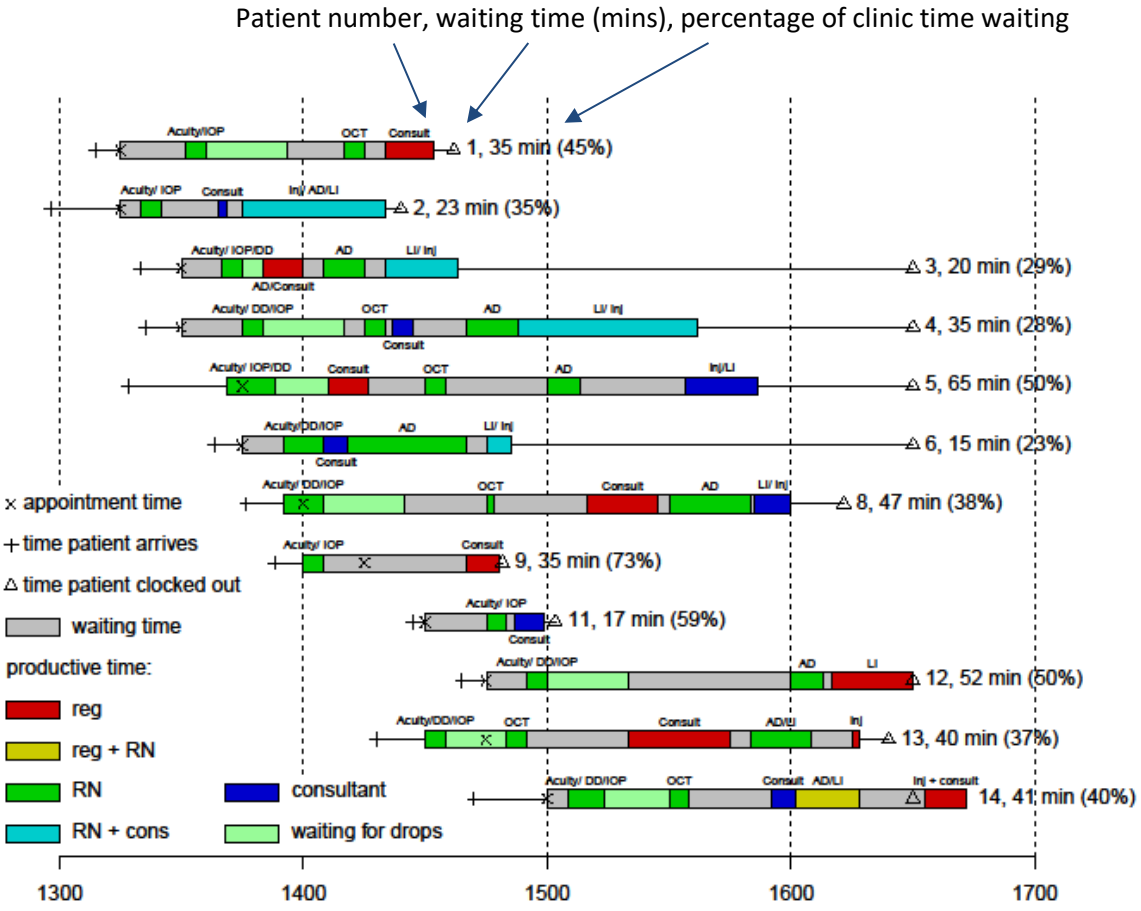


Figure 6.3 Patient waiting times in a Monday afternoon macular degeneration injection clinic

By comparing the field notes and graphs of the three patient tracking exercises, it was difficult to make recommendations as the clinics did not have the same staff composition every week. During the trial mapping session (Monday morning clinic) there was one extra consultant than the actual mapping session. Even though this doctor had their own patients, a bottleneck occurred near the end of the clinic where five patients were waiting to have the same eye test performed. The limiting factor was

the availability of a nurse and one piece of equipment. This bottleneck did not occur one week later, when only one consultant was present in the same clinic.

Staff-initiated solutions

The Monday morning general clinic staff decided that patient flow could be improved in their clinic. The macular degeneration clinic staff decided that as the clinic usually finished on time and there was already a written clinical pathway in place to aid patient flow (and their clinic waiting times were not as long as the Monday morning clinic), no change in practice was required.

All the redesign Working Group members worked in the Monday and Thursday morning general clinics (the clerical and nursing staff also worked on other clinic days). Several solutions were identified to aid in patient flow specifically during the Monday morning clinic and these were to be rolled out in other clinics if successful. Each solution and outcome will be discussed in turn.

Solution #1

A laminated orange card with the words "Fast Track Review" typed in bold font around all four edges (Figure 6.4) was placed inside each patient's file after all eye tests were completed. This card was larger than the file it was placed inside - and thus could not be lost inside the notes. The purpose of the card was to alert the medical practitioner that all the tests were completed, and that the patient was ready for their final consultation.

Figure 6.4 The "Fast Track Review" card

Outcome

Unfortunately, the Monday morning clinic was restructured after the initial patient tracking exercise to include an allied health assistant and an optometrist. The addition of the allied health assistant role

was not a result of the clinical redesign program, but the optometrist position was. The role of the optometrist will be elaborated on in Section 6.2.2 (Clinic demand and patient access). The clinic staff did not wish for another patient tracking exercise to take place until after they gained a second waiting room. This plan involved positioning the Ophthalmology patients in the underutilised ENT waiting area prior to their appointment. The Ophthalmology nurse was to escort each patient in turn around to the clinical area. The patient would then remain in the Ophthalmology clinic waiting area after each eye test. The purpose of this plan was to separate patients waiting for an initial consultation from those who had eye tests and eye drops, to better visualise patient flow. This change was not initially approved by clinic management but took place in December 2016 (after a change of management, but the data collection period had completed). To evaluate the change, the staff were asked their opinions of the "Fast Track Review" card in the patient survey and the results are discussed in Section 6.2.1.1 (staff survey results).

Solution #2

Due to the extended length of time spent in clinic, paediatric patients frequently became bored and uncooperative during their eye examination. To alleviate this problem, all paediatric patients (< 14 years) had their files placed inside a purple folder. The aim was to alert the staff that a child was in clinic and to minimise the amount of time the children spent in the waiting room.

Outcome

In the free-text section of the staff survey, two staff members remarked that the purple folders for children "help to identify priority", yet one Working Group member commented that certain staff avoided the purple folders as they did not feel confident examining small children. The avoidance of the purple folder by some staff was only discovered at the final Working Group meeting. Plans were then made to educate the staff regarding techniques for quick and safe eye examinations in children. This was to take place after the data collection period ceased.

Solution #3

The orthoptist and optometrists were to be trained on how to access patient details on the iPM system instead of relying on daily printouts of clinic appointments.

Outcome

Only one allied health staff member accepted the offer and undertook the training on how to access the patient appointment times on the iPM system. This was possibly because these part-time staff members arrived in clinic just prior to the session starting and left immediately after. Subsequently, all staff were notified of the instructions by email.

Solution #4

The reception staff were to take written messages and not forward non-urgent telephone calls to the nursing staff during clinic sessions. The nurses were to collect the messages at the end of the session from the reception area.

Outcome

The reception staff commenced taking messages instead of forwarding non-urgent calls. This practice ceased after a few weeks because the nursing staff did not collect the messages from reception area at the end of each clinic session. This problem was made worse by the reception staff leaving at 5 pm when their shift finished (even if patients and staff were still in clinic). The Working Group did not know this initiative had failed, as the researcher asked the booking clerks of the outcome during an informal discussion of the program.

Solution #5

With the aim of decreasing interruptions to patient flow during clinic sessions, emergency patients, inpatients and post-operative patients were given designated appointment slots. Policies were also to be written for the hospital wards specifying inpatient suitability to attend clinic (i.e. patients must arrive in a wheelchair and be well enough to remain in clinic for several hours).

Outcome

Appointment slots were created for emergency patients, inpatients and post-operative patients. The staff feedback on this initiative will be discussed in Section 6.1.1 (Staff survey results). The Working Group queried whether the policy regarding inpatient suitability for clinic should cover all outpatient clinics – not just Ophthalmology. This caused an implementation delay as management opinion was required. This had not been granted by the end of the data collection period.

Solution #6

A new printer was ordered to replace the need for patients to carry their stickers and forms from the reception to the clinical area.

Outcome

On arrival, the new printer was placed in the unmanned photocopy room in the clinical area. When each patient attended the registration desk, the clerk printed the patient stickers to the unmanned room. This solution was not the decision of the Working Group, but of management. This placed an extra burden on the clinical staff to regularly check the printer (as the patient sticker signalled each patient's arrival in clinic). The researcher witnessed the clinic running behind schedule one morning when the printer ran out of paper, and thus the clinical staff were not aware of patient arrivals. There were also instances of patient stickers not printing, causing tension between the clerical and nursing staff. After a few months of heated discussion, the printer was relocated back to the reception area and the patients resumed taking their paperwork around to the clinical area. This move pleased the clinical staff but not the clerical staff.

Staff survey results

At the end of the Intervention period, all the Ophthalmology clinic staff were asked their views of the progress of the redesign initiatives. All staff from the Monday morning general clinic responded to the staff survey (n=8), but no allied health or medical practitioner responded from the other clinics. Many of the nursing staff who worked on Mondays, also worked on the other days in the

Ophthalmology clinic. Staff were asked their perceptions of the changes to clinic flow as part of the staff survey (Table 6-1). Due to the low number of respondents, the answers of 'strongly agree' and 'agree' have been combined, as have 'strongly disagree' and 'disagree'. The staff were asked to respond to the following question.

To what extent do you agree with the following statements regarding the new changes to clinic flow?

Table 6-1 Survey results: Ophthalmology staff perception of the changes to clinic flow

Question	Strongly agree/agree	Strongly disagree/disagree	Unsure	n=
Q1. There are less unexpected "walk-ins"	3	3	2	8
Q2. Clinics are more likely to start on time	2	6	0	8
Q3. There are less interruptions to clinic sessions	1	6	1	8
Q4. Patients spend less time in the waiting room after their investigations have finished	3	3	2	8
Q5. Booking appointments for all paediatric patients improves patient safety	5	2	1	8

Most of the respondents (6/8) disagreed that "clinics were more likely to start and finish on time" and "there are less interruptions to clinic sessions" as a direct result of clinical redesign. The staff were divided on whether there were "less unexpected walk-ins" and "patients spend less time in the waiting room after their investigations have completed".

In the free-text question, the orange "Fast Track Review" card was documented by three staff members as beneficial. One respondent commented that some staff members were ignoring the card because "casual staff are not educated on its use". Five of the eight staff mentioned that patient flow was still an issue due to the following contributing factors:

- inpatients cannot always turn up at the allocated times;
- too many patients for the number of clinic staff;
- overbooking of sessions;
- not enough *Emergency* slots; and

- too many *Walk-ins* (unplanned appointments).

6.2.2 Clinic demand and patient access

This theme was divided into three main problems:

- triaging referrals, staffing levels and patient numbers;
- referral guidelines too broad; and
- high paediatric DNA rate and no regular wait list audit.

Each will be described separately, along with the solutions and the analysis of the solutions.

Problem: Triaging referrals, staffing levels and patient numbers

The use of the "EYE03" appointment code to overbook clinics was a well-known practice amongst staff. This increased the overall numbers of appointments to the extent that some morning sessions had not finished when afternoon sessions were starting. The Working Group felt there was a specific need for additional appointments for patients with macular degeneration (again these sessions were overbooked) and post-operative patients.

The procedure of how the referrals were triaged was also inconsistent. The referrals arrived by facsimile and were reviewed by a clerical staff member, followed by a triage nurse, and then the triage doctor. It was unclear at which point in this process the referral details should be entered in the iPM system.

Solution

The entire 4-weekly clinic rosters were reviewed for staffing levels and patient numbers. The booking codes for 18 clinics were adjusted to reflect the name of the health professional and the type of clinic, to make it easier for the clerical staff to book appointments e.g. EYERT2 = eye registrar number two. Four clinic codes were deemed redundant and were removed from use ("EYE03" was one of the deleted codes). Seven registrar clinic codes were added to decrease ambiguity in the booking process (as there were multiple registrars on the roster at any one time).

Designated appointment slots were organised with both the RHH and private providers, so that the patients could have their post-operative appointment in clinic the day after surgery. Also, to cater for the increased demand, one of the consultants agreed to work an additional weekly intraocular injection clinic for macular degeneration patients. The optometrists also worked additional sessions during the Intervention to clear the backlog of overdue diabetic retinopathy screening appointments.

A triage system was created whereby the booking clerk entered the referral on the iPM system and annotated the referral if the patient had been to clinic in the past; the nurse then triaged the referral, which was followed by the medical triage. The doctor wrote on the referral if the patient was to be allocated an appointment (category 1) or if the patient was to be placed on the wait list (category 2 and 3). Three different coloured folders were created - one for each staff member. As each staff member had completed their task, the referral was placed in the corresponding folder for the next staff member to work on.

Outcome

From the staff survey responses, both booking clerks commented that the new clinic codes caused confusion if two consultants were rostered to work during the same clinic session. The clinic code reflected the name of one of the consultants only, causing uncertainty when booking future appointments and calculating clinic revenue. It could not be determined by looking at the clinic code which consultant actually saw the patient. The clerks had to ask the patient which doctor they had the appointment with.

Even with the above changes, five staff members commented in the free-text section of the staff survey that clinic interruptions still resulted in high patient numbers in clinic. One booking clerk commented that communication with nurses and post-operative patients had improved because of the changes. The booking clerks were asked six additional questions about the redesign activities. Two replies were received, their answers were identical, and both staff were members of the Working

Group. They were the only two booking clerks employed in the clinic for the full duration of the study (Jan 2014-June 2016). The responses are presented in Table 6-2.

To what extent do you agree with the following statements since the initiation of the redesign activities?

Table 6-2 Survey results: Ophthalmology booking clerk survey responses

Question	n=2
Q11. Booking appointments takes less time	Strongly disagree (2)
Q12. There are less phone calls regarding appointments for post-op patients	Agree (2)
Q13. Clinics are less likely to be overbooked	Strongly disagree (2)
Q14. More patients return to reception after their appointment	Agree (2)
Q15. The rules concerning booking patient appointments are clear	Unsure (2)
Q16. Using the "3 coloured folders" improves the triage management process	Agree (2)

Due to the abovementioned confusion surrounding the new clinic booking codes it was not surprising that the new method of booking appointments did not take less time. Similarly, as clinics were still permitted to be overbooked, the medical staff and nursing staff also commented that there were still not enough appointments available.

Problem: Referral guidelines too broad?

To better manage the wait list, and for current patients to be seen in a clinically appropriate timeframe, the Working Group wanted to revise the referral guidelines to decide if any eye conditions could be safely treated/monitored by community eye health professionals.

Solution

The referral guidelines were updated to exclude the routine screening for diabetic retinopathy. This was in-line with practice in larger eye hospitals around Australia. Permission was required from the Health Minister and the hospital executive team. A letter was sent out to all GPs, ophthalmologists, endocrinologists, paediatricians and optometrists in Southern Tasmania informing them of the change. The wait list was then audited for diabetic retinopathy screening referrals. Patients on the wait list (and their GPs) were sent a letter stating the referral criteria had changed and that they had

been removed from the wait list. Current clinic patients with minimal or no diabetic eye disease (and their GPs) were sent a discharge letter stating when their next screening test was due. The screening could be performed by either their community optometrist or private ophthalmologist. Current clinic patients who were overdue their screening appointment had an appointment booked with the clinic optometrist, with a view to be discharged if the result was negative.

Thirty-two patients on the wait list for diabetic eye screening were removed and their care transferred back to a community optometrist (without being seen). Another 285 current clinic patients who had no/minimal diabetic retinopathy were discharged back to community care. Two hundred and fifteen patients were allocated an appointment with an optometrist in the clinic as their appointment was overdue (Table 6-3). The effect this change had on the discharge rate will be discussed in Section 6.3.7.

Problem: High paediatric DNA rate and no regular wait list audit

The Working Group sought a solution for the high DNA rate of paediatric patients and to find out how many paediatric patients were on the wait list for an appointment. There was only one audit of the wait list (all patient ages) in the previous 12 months, and regular auditing had ceased. The Working Group was concerned that there were people on the wait list (all ages) who no longer required an appointment, which resulted in wasted appointment slots.

Solutions

A clerical audit was undertaken by the clinical redesign support officer who examined the outpatient wait list for duplicate entries, patients who had attended their appointment (but were still on the list), patients who repeatedly failed to turn up to their appointment and for deceased patients. During this process, patient information was updated or corrected if found to be erroneous (Table 6-3).

Permission was granted by the nurse-in-charge to allocate all paediatric patients on the wait list an appointment date, rather than only book appointments up to six weeks in advance. The high

paediatric DNA rate was believed to be due to the inability to contact the parents when the appointments were allocated. When appointments are allocated as soon as the referral is received, there is a higher chance that the home address and phone numbers are current. For all paediatric patients' appointments to be booked, the files of the all children on the wait list and current clinic patients were audited. Out of 201 children, 41 had already attended the appointment or were discharged due to failure to attend their appointment. Another 38 patients were to have their files reviewed a second time and the remaining 122 patients were allocated an appointment by the end of the data collection period (Table 6-3).

Table 6-3 Outcome of the Ophthalmology clinic wait list and diabetic screening audits

Audit type	Removal from wait list	Current patients discharged	Patient history incorrect and updated	Required further clinical auditing	Allocated an appointment	Total patients
General adult wait list	16	25 (duplicate entries removed)	29	38		118
Diabetic retinopathy screening	32	285			215	532
Paediatric patients	41			38	122	201
Totals	**89**	**310**	**29**	**76**	**337**	**851**

6.3 Changes to patient flow

The Ophthalmology Outpatient clinic system can also be represented by the interconnection between the outpatient wait list, the outpatient clinic activity, the number of Ophthalmology theatre cases and the discharge rate of patients back to community care. As an evaluation of the changes to patient flow, the following metrics were calculated.

- Percentage of patients who waited longer than the clinically recommended time to attend their first outpatient appointment by triage category
- Median wait time to the first appointment by triage category
- Did Not Attend (DNA) rate
- Discharge rate
- Hospital and patient appointment cancellation rates
- The number of overdue follow-up appointments

Identical to the Plastic Surgery clinic, each of the above four interconnected areas was investigated to understand how the clinical redesign program impacted patient flow through the clinic system.

6.3.1 Ophthalmology Outpatient wait list

Even though the study dates were identical to the Plastic Surgery Outpatient redesign program, the Ophthalmology clinic had 7 more working days in the Intervention period. Table 6-4 outlines the key demographic comparisons between the Pre-study and Intervention periods.

Table 6-4 Demographic comparisons between Pre-study and Intervention periods

Pre-study period (January 2014-March 2015)	**Intervention period (April 2015-June 2016)**
454 calendar days	456 calendar days
303 clinic working days	310 clinic working days
1868 additions to the Ophthalmology Outpatient wait list comprising of: Category 1 = 37.7% (50% male) Category 2 = 22.3% (50% male) Category 3 = 37.9% (44% male) Unknown = 2.1%	1430 additions to the Ophthalmology Outpatient wait list comprising of: Category 1 = 34.6% (50% male) Category 2 = 50.8% (45% male) Category 3 = 14.5% (40% male) (1 patient unknown triage category)
Unknown number of theatre cases	Unknown number of theatre cases

The number of patients added to the wait list was less during the Intervention period (1868 vs 1430). The number of Ophthalmology theatre cases could not be determined, due an unknown number of cataract procedures performed in private hospitals. As the method of triaging the referrals altered three times during the Pre-study period, this was considered in Section 6.3.4 when the waiting times for appointments were analysed.

Even though the absolute number of patients accepted onto the wait list was different between the two periods, the age distribution of the patients was similar. The first cluster of patients were aged 1-6 years. The number of accepted referrals was the lowest between 10 and 20 years of age, and then there was a steady increase in patients with increasing age, with the second cluster peaking in the 60-80-year age group (Figure 6.5 and Figure 6.6).

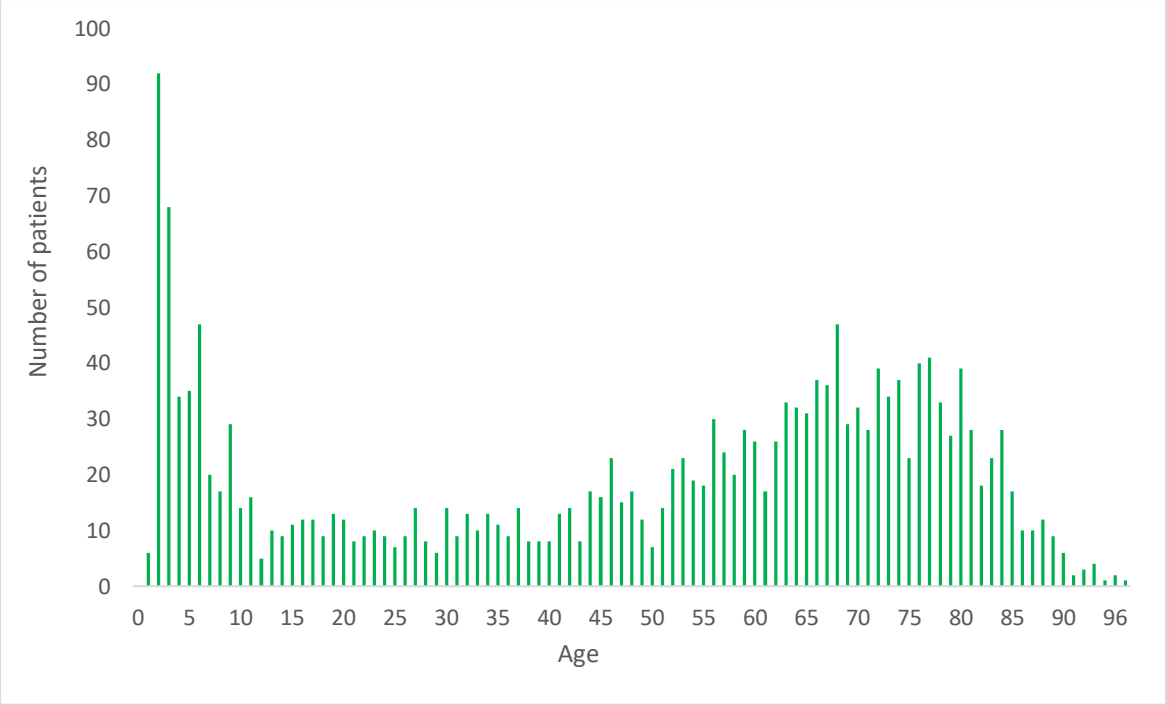


Figure 6.5 Age of patients when added to Ophthalmology wait list (Pre-study)

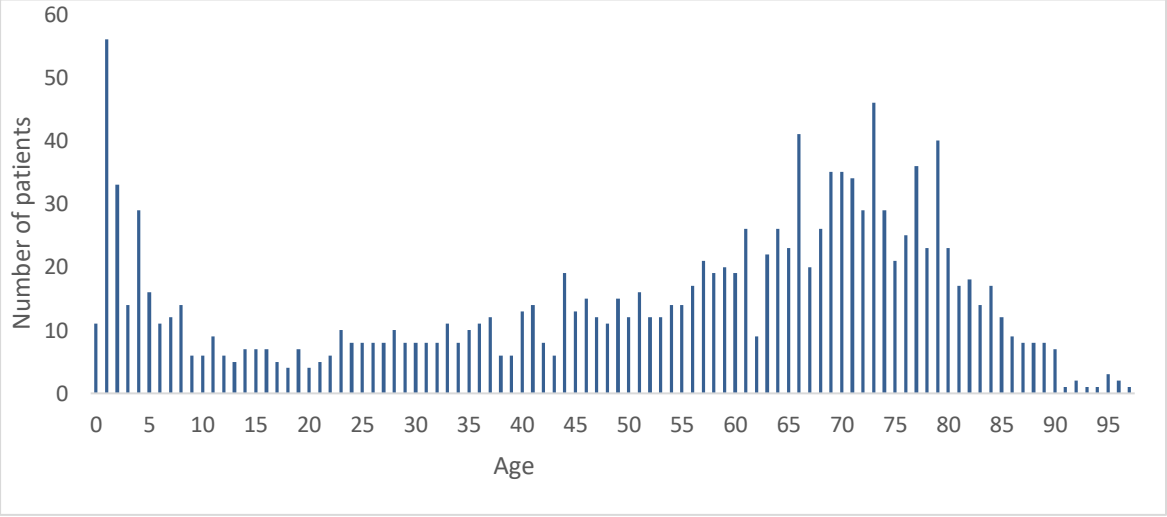


Figure 6.6 Age of patients when added to Ophthalmology wait list (Intervention)

6.3.2 Wait list analysis

As with all the Working Groups, the Ophthalmology Working Group also received monthly addition and removal data, together with an up-to-date total of the number of patients on the wait list. The change in the wait list numbers over the 30-month study period is shown in Figure 6.7, and this was how the final report was presented to the Ophthalmology Working Group at the completion of the project.

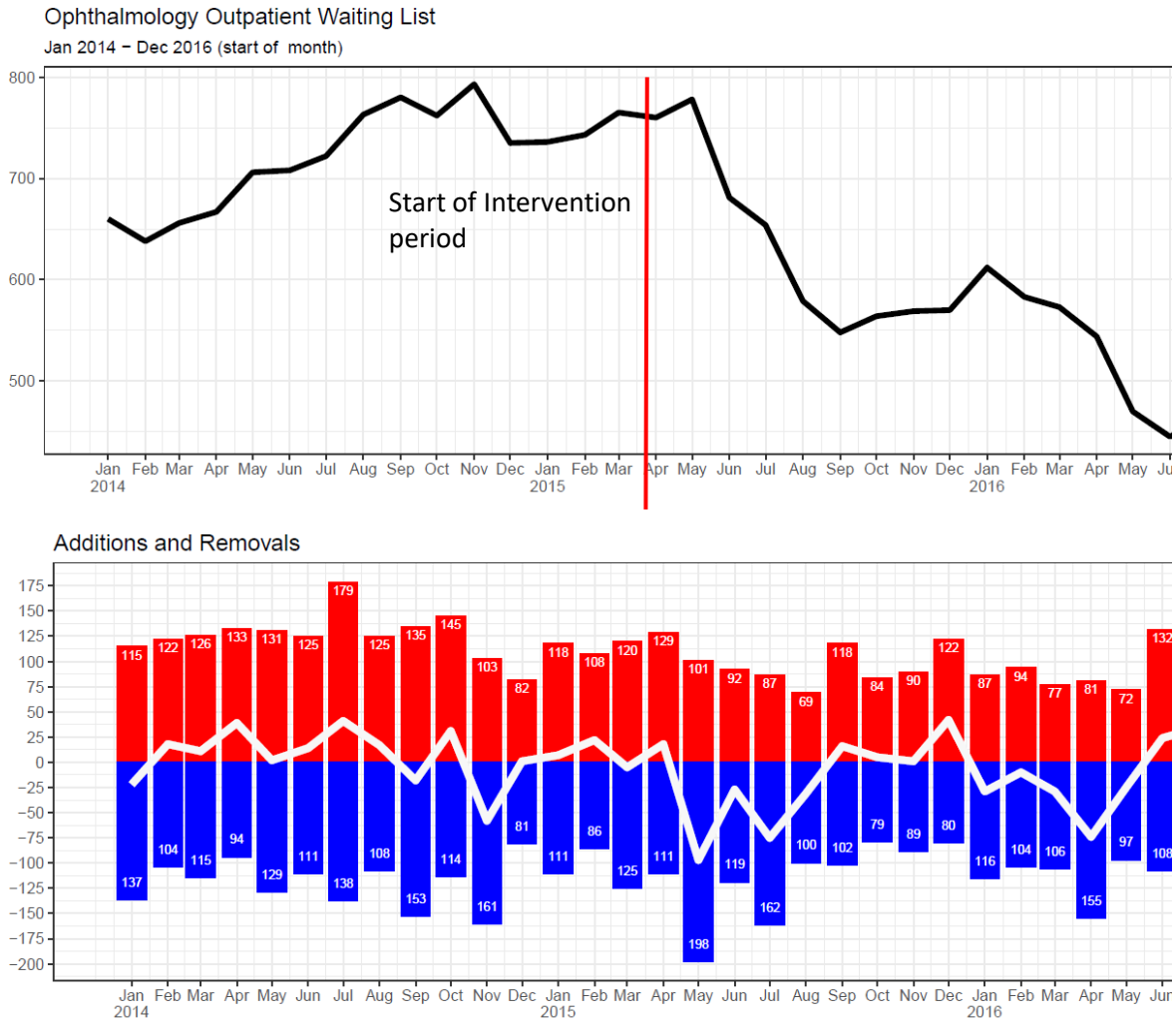


Figure 6.7 Changes in the Ophthalmology wait list (January 2014-June 2016)

Overall, the number of additions to the wait list increased during the Pre-study period by 100 and decreased during the Intervention by 296. The additions and removal numbers of patients by triage category are shown in Table 6-5.

Table 6-5 Additions and removals from the Ophthalmology wait list by triage category

	Pre-study period			Intervention period		
Triage category	**Additions**	**Removals**	**Net**	**Additions**	**Removals**	**Net**
1	704	579	**+ 125**	495	611	**-116**
2	416	301	**+115**	726	720	**+6**
3	708	841	**-133**	208	395	**-187**
Unknown	40	47	**-7**	1	-	**+1**
Totals	**1868**	**1768**	**+100**	**1430**	**1726**	**-296**

6.3.3 Clinic attendance from the wait list

The next step in the analysis was to examine how the number of patients who *Attended* an appointment from the wait list changed over the study period (Table 6-6). Statistical analyses were not performed on these results due to the difficulty in attesting any change to the redesign program and not to the change in the referral triage management procedure.

Table 6-6 Patients from the wait list who* Attended *an appointment at the Ophthalmology clinic

Triage category	**Number of patients who *Attended* an appointment from the wait list**	
	Pre-study period	**Intervention period**
Category 1	508	484
Category 2	229	577
Category 3	678	297
Unknown	43	
Total	**1458**	**1358**

Figures 6.8 and 6.9 show how the number of additions and removals from the wait list changed over the study period. As the Triage period 1 and 2 occurred before the employment of the current triaging physician, the cause of differences could not be accurately determined. As can be seen from the figures, during Triage period 1 most patients added and removed from the wait list were category 3. During Triage period 2, most of the accepted referrals were assigned to category 1 and when the new triaging physician began employment in November 2014, more patients were triaged as category 2 which caused the proportion of category 1 patients to decrease.

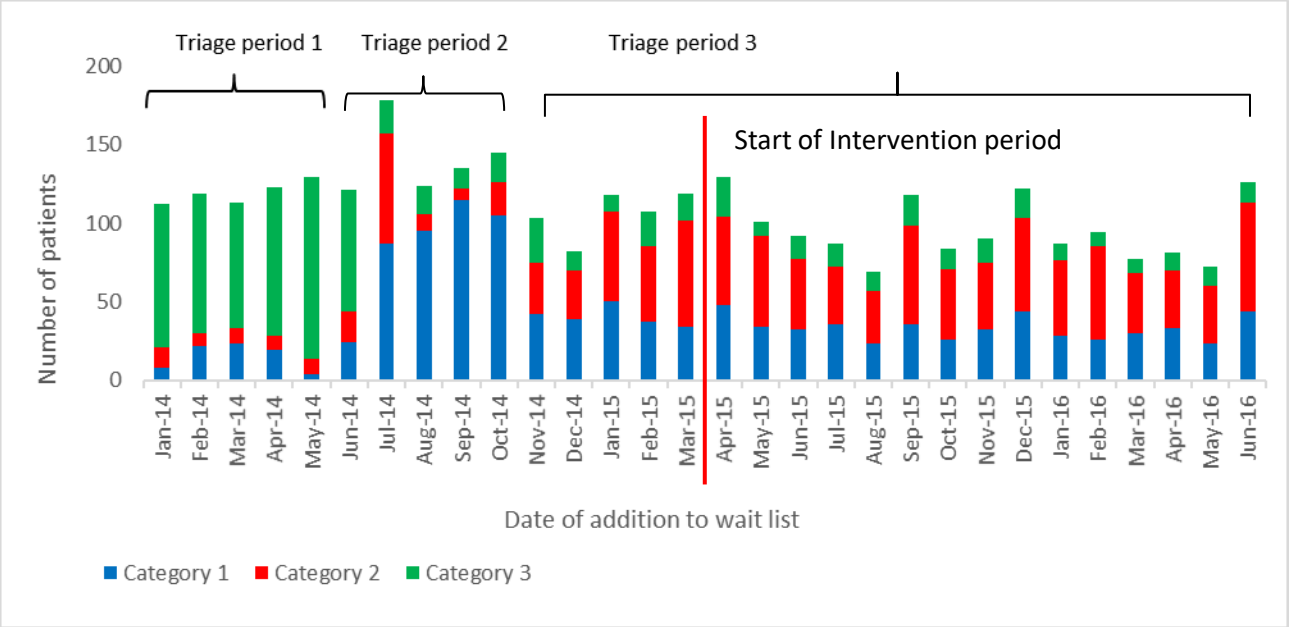


Figure 6.8 **Triage category of patient additions to the Ophthalmology clinic wait list**

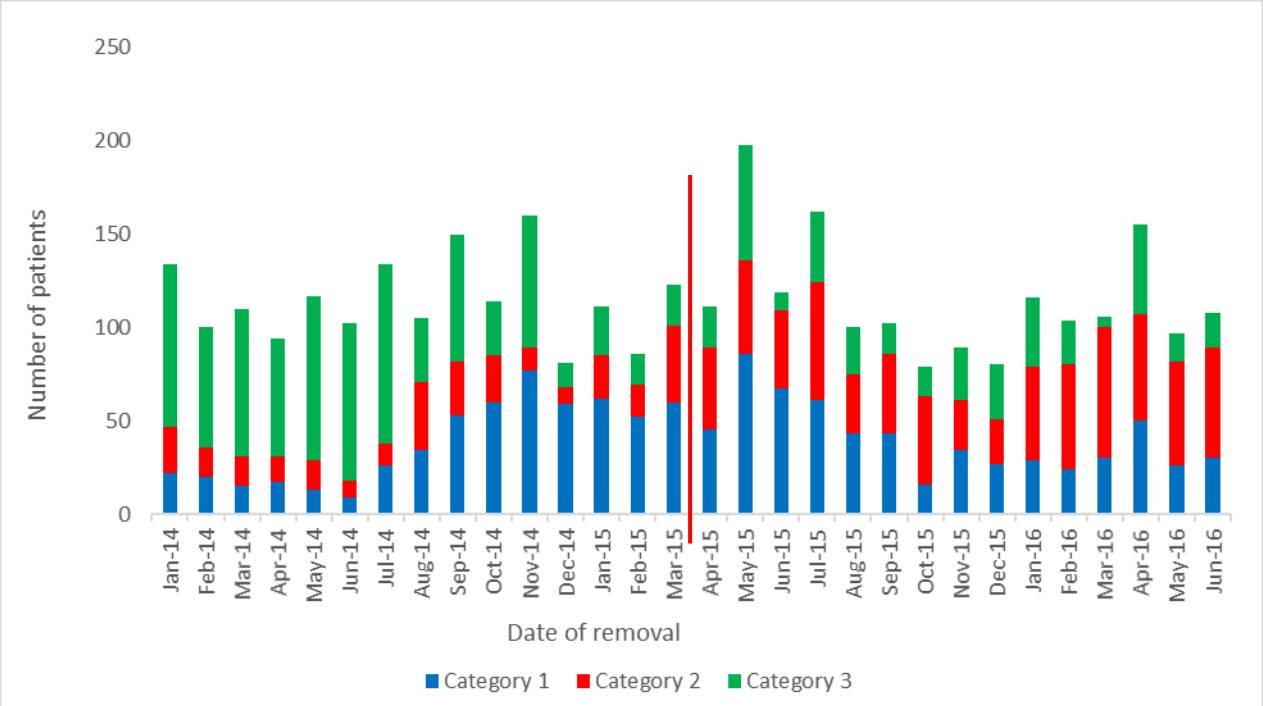


Figure 6.9 **Triage category of patient removals from the Ophthalmology outpatient clinic wait list**

6.3.4 Waiting time analysis

It was not known how or if the different triaging periods would impact on the results of the redesign program and in-turn on patient flow. The next phase of the study set out to determine this. Patient flow was measured by a change in:

- the percentage of patients who waited longer than the clinically recommended time before attending their first outpatient appointment; and
- the median wait time to the first appointment by triage category.

Each triage category was analysed separately.

6.3.4.1 Category 1 patients waiting time analysis

The target for category 1 patients was to attend the first appointment within 30 days of receiving the referral. The monthly percentage of patients waiting longer than 30 days each month is displayed in Figure 6.10.

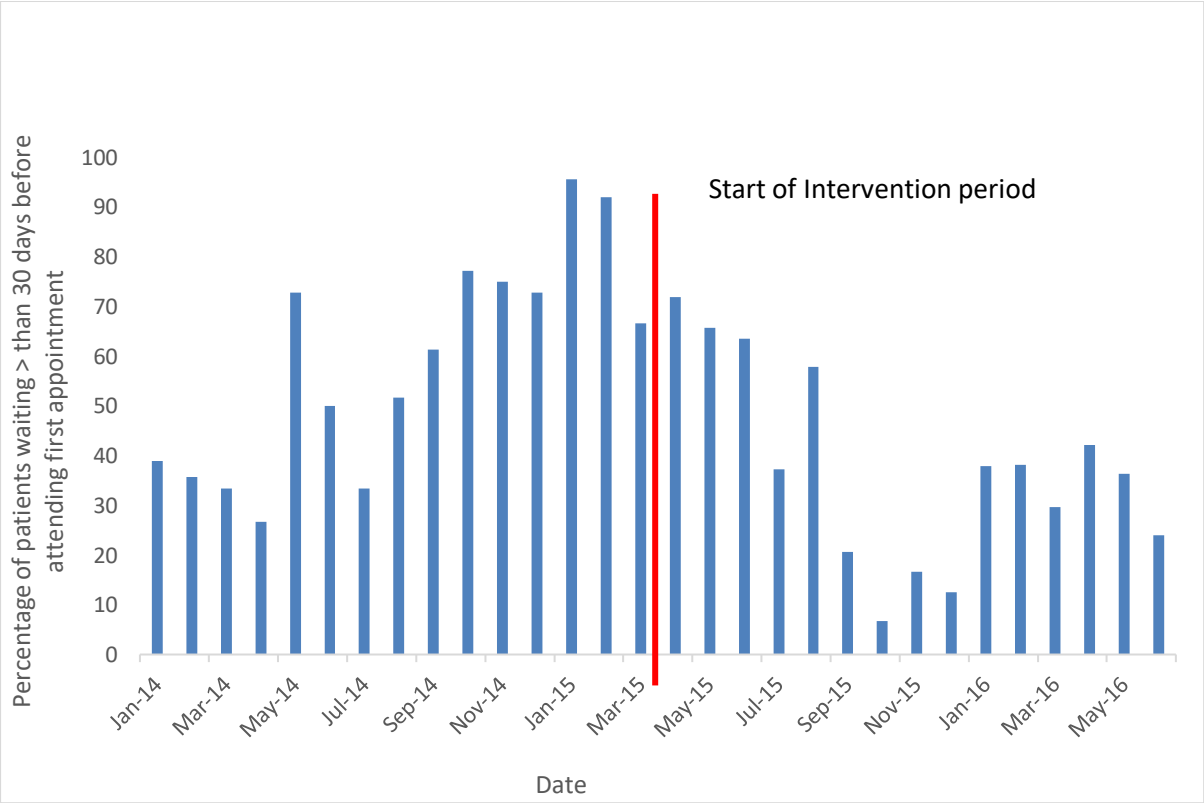


Figure 6.10 Percentage of category 1 patients waiting longer than 30 days before attending the first appointment

The number of category 1 patients who waited more than 30 days for their first appointment decreased during the Intervention period from 67.9% to 43.2% ($p< 0.0001$, χ^2). The median wait time also decreased, from 52 to 27 days ($p<0.0001$, Mann-Whitney). This result was almost certainly due to a decrease in the number of category 1 additions to the wait list from November 2014 onwards (when the method of triaging referrals changed for the third time). During July to October 2014, 402

category one patients were added but only 173 category one patients were removed from the wait list. Due to this imbalance, by November 2014, many category 1 patients had already waited longer than 30 days for their appointment. The median wait time for category 1 patients in November 2014 was 64 days, and this increased to a maximum median wait time of 141 days in February 2015, as displayed in Figure 6.10. It took until September 2015 for the 90th percentile wait time to decrease dramatically to be less than 30 days.

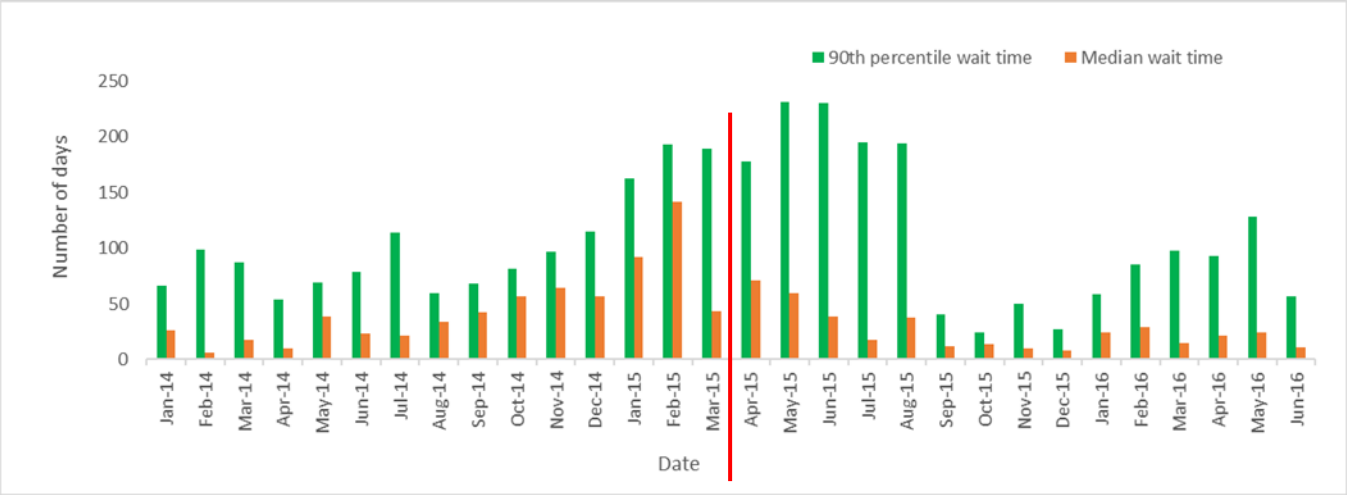


Figure 6.11 Median and 90th percentile wait times for category 1 patients per month

6.3.4.2 Category 2 patients waiting time analysis

The target for category 2 patients was to attend the first appointment within 90 days of the clinic receiving the referral. The percentage of Category 2 patients who waited more than 90 days for their first appointment decreased during the Intervention period from 79.0% to 66.4% (p= 0. 0004, χ^2). Even though the result was statistically significant, most patients still waited longer than 90 days during the Intervention period, as displayed in Figure 6.12.

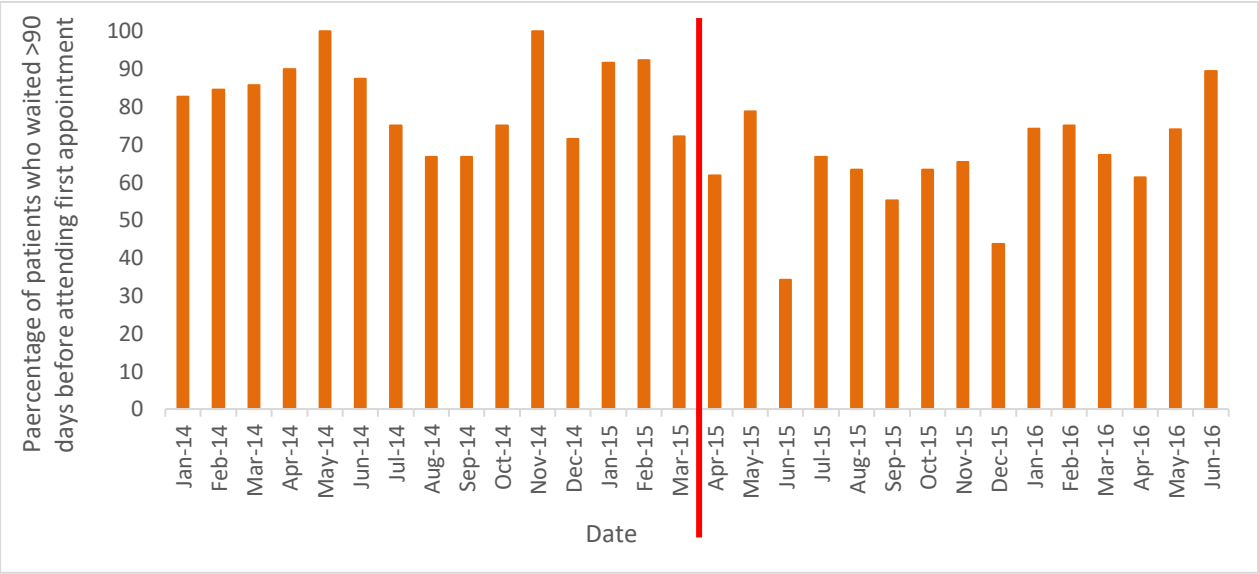


Figure 6.12 Percentage of category 2 patients waiting longer than 90 days before attending the first appointment

There were 416 category 2 additions during the Pre-study period but only 301 removals, resulting in a net gain of 115 patients. The median wait time to the first appointment peaked in June 2014 at 452 days (Figure 6.13) – this wait time was 5 times longer than the clinically recommended time of 90 days. Despite the number of category 2 additions increasing dramatically after November 2014 (the third triaging period), this was matched by an increase in removals. Overall, the median wait time decreased from 183 to 123 days ($p<0.0001$, Mann-Whitney).

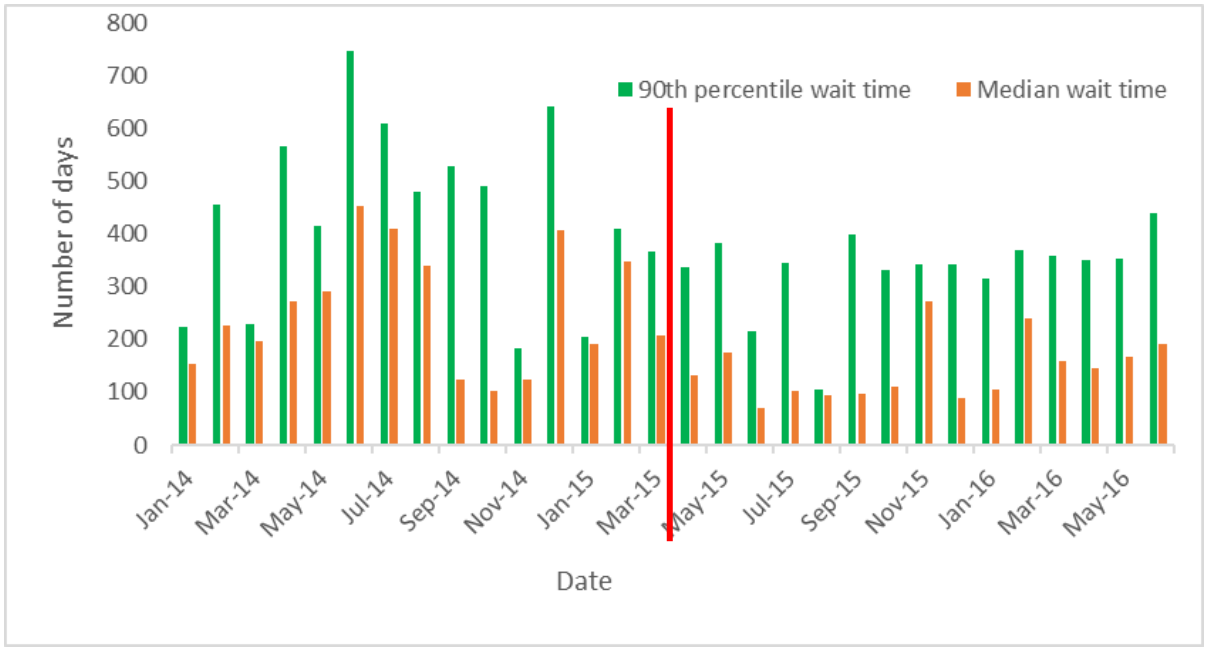


Figure 6. 13 Median and 90th percentile wait times for category 2 patients per month

6.3.4.3 Category 3 patients waiting time analysis

The target for category 3 patients was to attend the first appointment within 365 days of the clinic receiving the referral. The graph of the Category 3 patients who waited longer than the target of 365 days before attending their first appointment displayed a dramatic change after September 2014 (Figure 6.14).

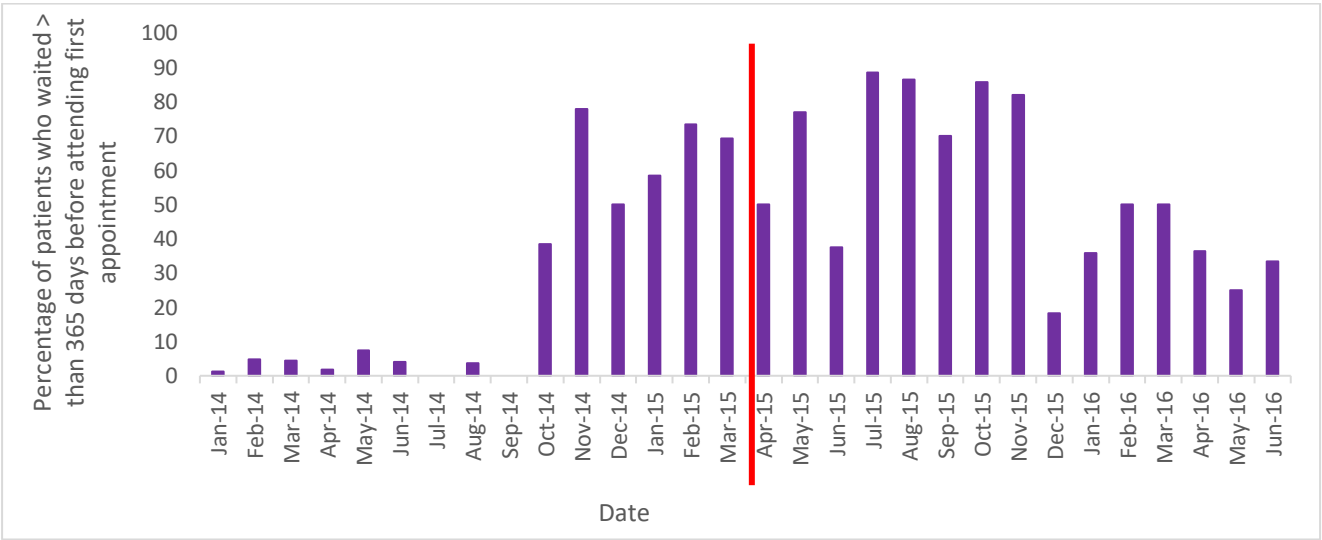


Figure 6. 14 Percentage of category 3 patients waiting longer than 365 days before attending the first appointment

During the first nine months of the Pre-study period less than 10% of patients in any one month waited more than 365 days to attend their first appointment. In October 2014 this figure increased to 38%. The percentage of patients waiting longer than the clinically recommended time of 365 days increased significantly in the Intervention period from 13.3% to 57.6% ($p< 0.0001$, χ^2).

To find the cause of this sudden and dramatic rise, wait list data prior to the Pre-study period was investigated. It was uncovered that during September to December 2013, there was 247 more additions than removals of category 3 patients to the wait list. The net movement of patients on the category 3 wait list from January 2013-October 2014 is shown in Figure 6.15. As it takes 365 days on the wait list before a category 3 patient waits longer than the clinically recommended time, the sudden rise in October 2014 was due to the large net increase in the number of referrals in the previous twelve months.

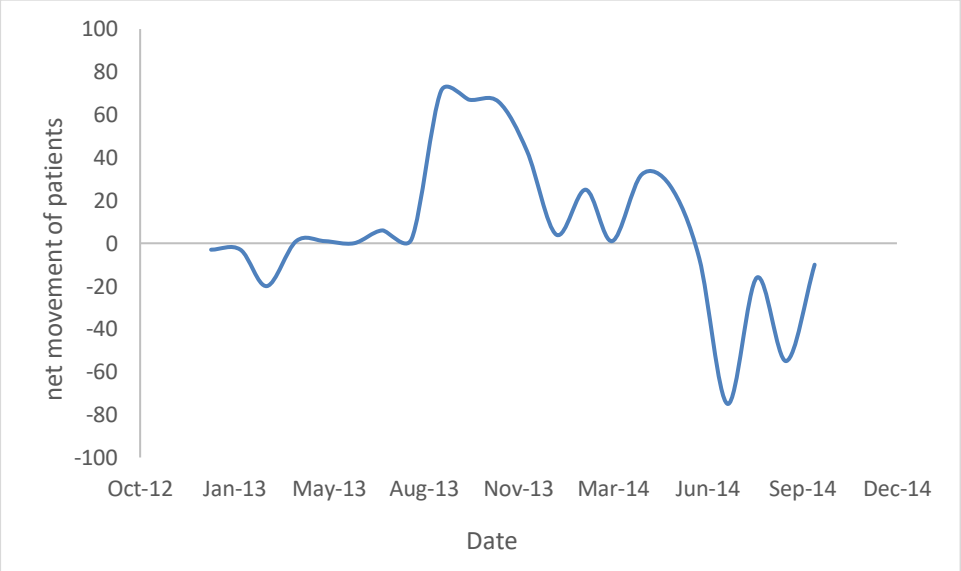


Figure 6. 15 Net movement of category 3 patients on the wait list (January 2013 – October 2014)

The graph of the 90th percentile and median wait times shows the median wait time peaked in February 2015, even though there were more removals than additions from the wait list from June 2014 onwards (Figure 6.16). These results demonstrate the significance of the wait list composition inherited at the beginning of the Intervention period. Even though there were 208 category 3 additions and 395 category 3 removals during the Intervention period, there were 315 patients already

on the category 3 wait list at the start of the Intervention period. Therefore, it is important to look at more than one measure when monitoring wait list changes over time. Ideally, the number of additions and removals to a wait list would not fluctuate greatly during the Pre-study period to enable an accurate measure of a redesign program. Conversely, the study period should also be long enough so that any changes in practice can be fully evaluated.

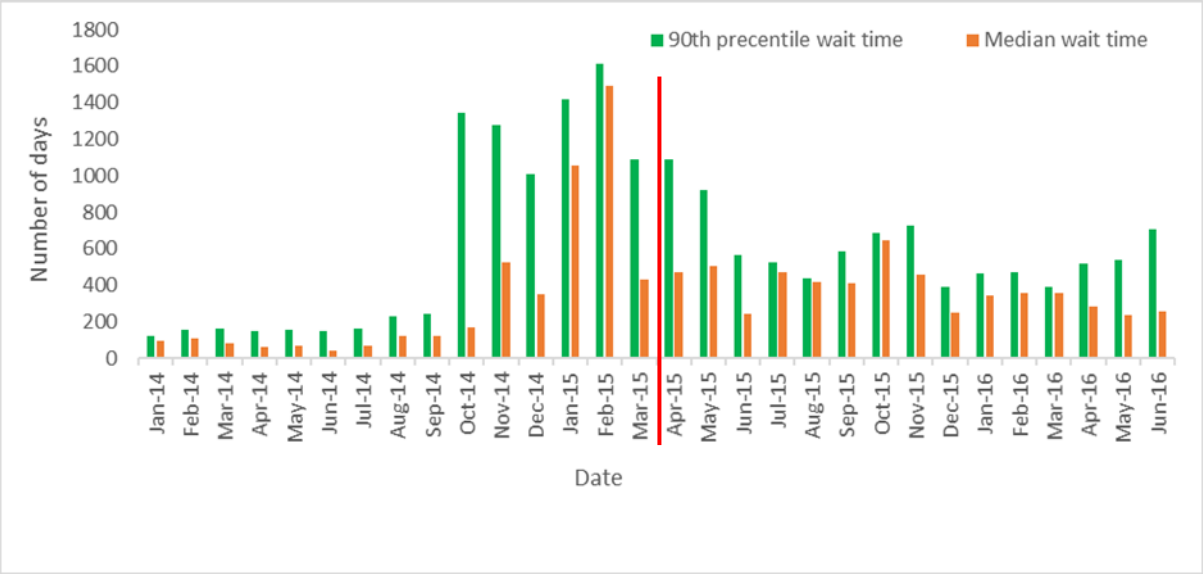


Figure 6. 16 Median and 90th percentile wait times for category 3 patients per month

6.3.5 Appointments *Attended*

The number of patients who *Attended* appointments from the wait list decreased during the Intervention period, representing a decrease in the number of *New* and *Emergency* appointments. The next stage in the analysis was to compare the total number of appointments *Attended* during the two phases, to find out if the number of *Review* appointments changed. It was known from the Plastic Surgery Outpatient clinic data analysis that *Review* appointments are the most common appointment type.

Unfortunately, the raw appointment data did not allow a direct comparison of *Attended* appointments for the two study phases. This is because the "EYE03" clinic code comprised 19.2% of all *Attended* appointments during the Pre-study period and only 3.6% during the Intervention (before the code was

deleted from the booking system). The "EYE03" appointments could not be reliably attributed to a clinician (this code was used book appointments for all eye health professionals) and this code was also used to count the number of eye tests which were conducted by the nursing staff. Including all the "EYE03" appointments would artificially increase the number of *Attended* appointments in the Pre-study phase. Table 6-7 illustrates the change in attendance figures when the "EYE03" appointments are included and excluded.

Table 6-7 Ophthalmology clinic attendance comparisons using different measures

	Pre-study	**Intervention**
Clinic working days	303	310
Attended appointments from wait list	1458	1358
All *Attended* appointments	10209 (excluding "EYE03") 12633 (including "EYE03")	10496 (excluding "EYE03") 10888 (including "EYE03")
Number of individual patients	4506	4138
Calculated 'patient days'	9608	9937
Percentage of patients who *Attended* one appointment (one 'patient day')	51.7 %	47.0 % (Chi-square test, p=0.00001))
Median number of 'patient days' per patient	1	2
Mean number of 'patient days' per patient	2.1	2.4

As an indication of patient flow, the number of individual patients who *Attended* at least one appointment during each phase was compared. There was a decrease in the number of patients between the Pre-study period and the Intervention period (4506 vs 4138). Because the number of appointments each patient *Attended* is unknown, the complexity of each patient's visit cannot be inferred from this comparison.

A new metric was needed to reflect how many times each patient visited the clinic during each phase of the study (to counteract the Pre-study "EYE03" inflated appointment numbers). The term 'patient day' was devised to describe the number of days each patient *Attended* the clinic during the study periods. To calculate this figure, the date of each appointment and the unique patient identifier was merged in Microsoft Excel™ to make one number, and then the duplicates were removed. The total number of visits in both study periods were then compared. One 'patient day' was equivalent to one

patient attendance regardless of the number of health professionals consulted on each day. As displayed in Table 6-7, the number of individual patients who *Attended* the clinic decreased in the Intervention phase (4138 vs 4506), but the calculated 'patient days' increased. This corresponds to a decrease in the overall number of patients *Attending* appointments, but patients are attending more frequently. The proportion of patients who *Attended* one appointment in each study phase decreased significantly from 51.7% to 47.0%, ($p=0.0001$, χ^2).

The success of the redesign program in terms of describing attendance figures was always going to be hard to quantify due to the practice of overbooking clinic sessions at the beginning of the study. A decrease in patient numbers in specific sessions was a desired outcome for staff. There was a decline in the number of both patients and *Attended* appointments from the wait list, but patients were presenting to clinic more frequently. This result can be illustrated as a histogram (Figures 6.17 and 6.18). During the Pre-study period, 2341 patients *Attended* clinic on one day only during the 15-month period, and this figure decreased to 1946 in the Intervention, despite an increased overall number of 'patient days'.

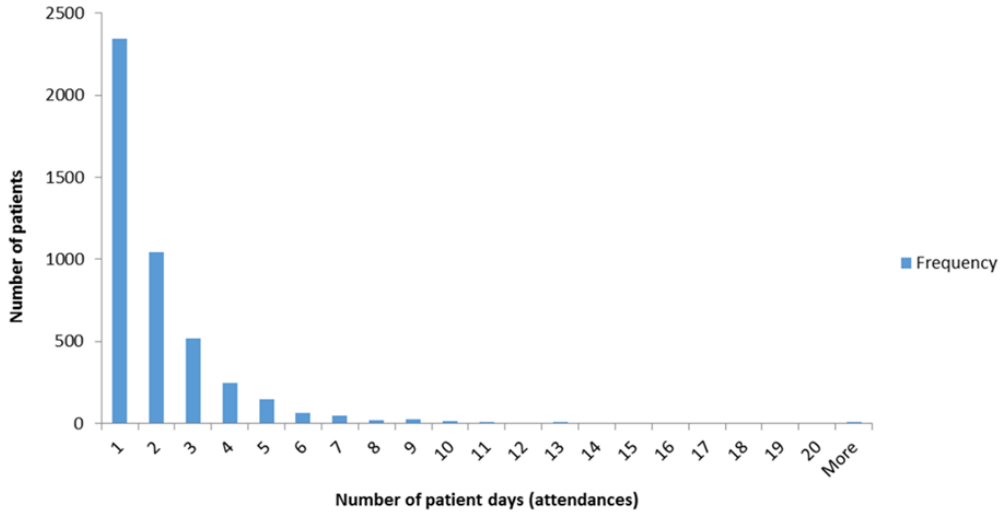


Figure 6. 17 Histogram of 'Patient days' during the Pre-study period

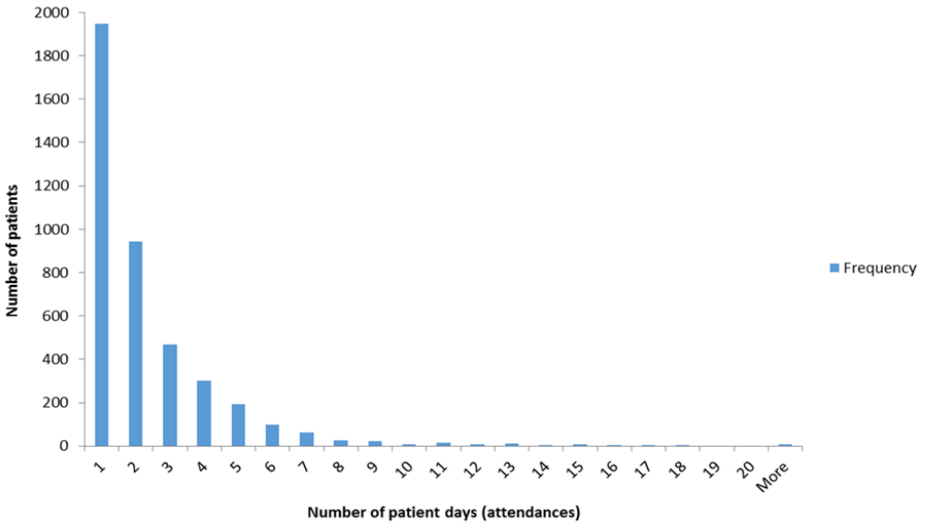


Figure 6. 18 Histogram of 'Patient days' during the Intervention period

It is known that patients who require intraocular injections attend regular appointments. These patients can present for macular degeneration treatment every 8-12 weeks. Additional intraocular injection clinic sessions were added during the Intervention period. The intraocular injection clinic attendance figures were examined to investigate if this patient group was contributing to the increased number of 'patient days' (Table 6-8). The extra clinics during the Intervention contributed an extra 61 patients and an additional 184 'patient days'. This patient group was not the sole contributor to the additional 'patient days' overall, as there was an extra 329 'patient days' during the Intervention period.

Table 6-8 Comparison of Intraocular injection clinic patient numbers

Intraocular injection clinic statistics	Pre-study	Intervention
Total number of patients	78	139
Total number of 'patient days'	248	432
Mean number of patient days	3.2	3.1
Median number of patient days	1	1

6.3.6 Did Not Attend rate

By auditing the wait list (to remove patients who no longer required an appointment) and narrowing the referral criteria (to exclude diabetic retinopathy screening category 3 patients), it was envisaged that the DNA rate may decrease. It has been established that an extended time on the wait list is correlated to a high patient DNA rate.[130, 131] After correcting for the additional "EYE03" appointments

(by not including nursing appointments in the calculations) there was no statistical difference in the DNA rate for all appointments between the Pre-study period and Intervention (13.8% v 14.0%, $p>0.05$, χ^2).

When the DNA rate was examined according to type of appointment and health professional, there was only one statistical difference between the Pre-study and Intervention periods. The orthoptist DNA rate increased from 19.1% to 22.7% during the Intervention period ($p=0.001$, χ^2). The overall number of orthoptist appointments decreased during this time (coinciding with the commencement of the new allied health assistant). When the attendance and DNA appointment figures for both the allied health assistant and the orthoptist were combined, the orthoptist + allied health assistant DNA rate did not significantly change, from 19.1% to 21.0% ($p>0.05$, χ^2), as displayed in Table 6-9. The appointments allocated to the allied health assistant did not replace the optometry appointments, as their appointment numbers increased at the time the allied health assistant commenced duties.

Similar to the Plastic Surgery Outpatient clinic, each type of appointment had its own specific DNA rate. The intraocular injection clinic had a very low DNA rate (6.0%); this high attendance rate may be attributed to the perception by patients that attendance to this clinic is potentially sight-preserving. The Monday morning clinic was included because this clinic contained most of the staff from the Ophthalmology clinical redesign Working Group, but there was no change in the DNA rate.

The high paediatric DNA rate was specifically targeted by the Working Group. The initiative resulted in all paediatric patients (< 14 years) being allocated an appointment on receipt of the referral (instead of six weeks prior to the appointment). Unfortunately, this change in policy was only completed one month before the end of the data collection period and therefore did not have a demonstrable impact on the DNA rate.

Table 6-9 DNA rates for different Ophthalmology appointment types

Appointment Type	Pre-study (number of appointments)		Intervention (number of appointments)		p-value for difference (chi-square test)
	Attended	DNA	Attended	DNA	
All*	9457	1554 (14.1%)	10175	1628 (13.8%)	0.5
New	1732	404 (18.9%)	1671	439 (20.8%)	0.1
Emergency	622	104 (14.3%)	296	47 (13.7%)	0.8
Review	7275	1159 (13.7%)	8096	1244 (13.3%)	0.4
All doctors	6152	840 (12.0%)	6762	833 (11.0%)	0.05
Optometrists	860	152 (15.0%)	1193	221 (15.6%)	0.7
Orthoptist	2365	558 (19.1%)	1825	536 (22.7%)	0.001
Orthoptist + allied health assistant	2365	558 (19.1%)	2156	574(21.0%)	0.07
Paediatric patients** (<14 years)	1028	382 (27.1%)	996	423 (29.8%)	0.1
Intraocular injection clinic	249	16 (6.0%)	432	25 (5.4%)	0.8
Monday am clinic (3 doctors)	1811	296 (14.0%)	1582	241 (13.2%)	0.5

*All nurse appointments excluded to correct for the "EYE03" appointments

** Paediatric patients consulting the orthoptist were used as a proxy to calculate the DNA rate. All paediatric patients saw the orthoptist during an appointment.

The Ophthalmology staff were also asked about their knowledge of the new DNA policy. As there were only 8 staff surveys completed, and four surveys were completed by members of the Working Group, there was a pre-existing knowledge of the new DNA policy. Interestingly though, there were two staff members who disagreed with the statement "The new DNA policy was well implemented" and both were Working Group members (Table 6-10).

Table 6-10 Ophthalmology DNA policy staff survey responses

Question	Strongly agree + Agree	Disagree	Unsure	n
Q6. I am aware of the new DNA policy	7	-	1	8
Q7. I have read the new DNA policy	7	-	1	8
Q8. I have referred to the new DNA policy for information regarding a patient	6	-	2	8
Q9. The new DNA policy was well implemented	4	2	2	8
Q10. The new DNA policy increases general patient access to clinics	7	-	1	8

6.3.7 Discharge rate

The formal guidelines for discharging patients, intended for the registrars, orthoptists and optometrists, were not completed by the end of the Intervention period and consequently the discharge rate was not expected to alter dramatically. As with the Plastic Surgery clinic analysis, the discharge rate was only calculated on *Review* appointments, because this was the appointment type targeted by the clinical redesign program.

To be discharged, each patient was required to *Attend* the appointment as per the iPM booking system. The discharge rate was calculated by dividing the number of *Attended* appointments that had an outcome of *Discharged* by the number of *Attended* appointments for each of the two study periods. Similar to the Plastic Surgery clinic analysis, when the raw data was inspected it was found to be incomplete. The discharge status was unknown for 2190 out of 7269 *Attended Review* appointments in the Pre-study period. This figure was higher than the known number of discharges (459 during the Pre-study period). The data quality did improve, as the 'discharge status unknown' rate decreased from 30.1% to 14.1% during the Intervention (Table 6-11). As the proportion of 'discharge status unknown' decreased during the study, a correction could not be made to perform a statistical analysis. It can be concluded though, that data entry completion improved during the Intervention period.

Table 6-11 Discharge rates for* Review *appointments in the Ophthalmology outpatient clinic

Number of appts	**Consultant**		**Optometrist**		**Orthoptist**		**Nursing**		**Registrar**		**Totals**	
	Pre	**Post**	**Pre**	**Post**	**Pre**	**Post**	**Pre**	**Post**	**Pre**	**Post**	**Pre**	**Post**
Appts *attended*	2611	3252	449	623	1935	1793	668	329	1606	2111	7269	8108
Appts D/C	212	311	32	58	82	98	4	28	129	203	459 **6.3%**	698 **8.6%**
Appts Not D/C	1962	2539	249	495	1001	1312	331	249	1077	1670	4620	6265
D/C status unknown	437	402	168	70	852	383	333	52	400	238	2190 **30.1%**	1145 **14.1%**

Appts=Appointments
D/C= Discharged

6.3.8 Appointment cancellation rates

Identical to the Plastic Surgery clinic analysis, the HSI data analysts combined both the cancelled (appointments cancelled and not rescheduled) and rescheduled appointments (appointments cancelled and then rescheduled) into one value which was reported to the Working Groups. The RHH previously collected only cancelled appointment data. The reason for combining the data was to quantify the amount of waste produced in the form of both rescheduled and cancelled appointments. The term "cancellations" henceforth refers to a combination of the two data sets.

The Ophthalmology clinic had similar data integrity issues as the Plastic Surgery clinic. The same inconsistencies were found in the procedure for cancelling appointments. Again, an audit was conducted on all the *Cancelled* appointments during the Intervention to investigate this issue. In conjunction with the data analysts, the decision was made not to analyse the cancellation data any further. As can be seen in Table 6-12, the reason for the cancellation was not documented in 80% of cases and the *Cancelled by* could not be accurately determined in 76% of the cases.

The original plan to quantify waste was still possible by using a ratio of *Attended* to *Cancelled* appointments. For every 2.4 appointments *Attended* during the Pre-study period, 1 appointment was *Cancelled*. This ratio did not change appreciably during the Intervention period; for every 2.3 appointments *Attended*, 1 appointment was *Cancelled* ($p>0.05$, χ^2). The reason for the lack of improvement was due to the work of the redesign program itself. Each appointment previously booked using one of the now redundant codes (e.g. "EYE03"), required the booking to be *Cancelled* and another one created using one of the new codes. The appointment time and date did not change, and the patient did not need to be notified. These cancellations could not be distinguished from actual patient or hospital-induced cancellations, and thus the cancellation rate was artificially inflated during the Intervention period.

Table 6-12 Audit of all **Cancelled** *Ophthalmology clinic appointments during the Intervention period*

***Cancelled reason*:**	***Cancelled by*:** Administration	Hospital	Not specified	Patient	Carer	(Data field left blank)	**Total**
Clinician cancelled patient	19	21		2	2		**44**
Created in error	41	19	1				**61**
Not specified			72				**72**
Other	95	31		85	3		**214**
Appointment no longer required	10	54	1	209	5		**279**
Earlier booking made	47	7		11			**65**
Patient is inpatient	7	3		6			**16**
Deceased			17	1			**18**
Administration	5	4					**9**
Patient convenience				55			**55**
Patient - medical condition				26	1		**27**
Patient Date/time unsuitable		2		73			**75**
Cancelled by SMS				2			**2**
(Data field left blank)	45	38	3437	168	2	11	**3701**
TOTAL	**269**	**179**	**3528**	**638**	**13**	**11**	**4638**

6.3.9 Overdue follow-up appointments

In September 2015, the number of overdue follow-up appointments was first reported by HSI on request by the Ophthalmology Working Group. The following document is a copy of the final report supplied to the Ophthalmology Working Group in December 2016 (after the data collection period was finished). Appointments more than 2 years overdue were not included. The data was downloaded from the iPM booking system on four separate census dates. All the overdue appointments on each of these dates were collated and displayed into one of six time cohorts, ranging from appointments less than four weeks overdue to appointments more than 12 months overdue, as shown in Figure 6.19.

The largest decrease in the number of overdue appointments was between December 2015 and April 2016, when the number of overdue appointments decreased by 385. Using the diary supplied by the project support officer, 285 patients were discharged as a direct result of the program during this 5-month period (mainly from the wait list audits and the cessation of the diabetic retinopathy screening service). Due to the missing appointment data (as discussed in Section 6.3.7) the discharge rate could not be accurately calculated but using the above information the discharge rate probably increased during this period.

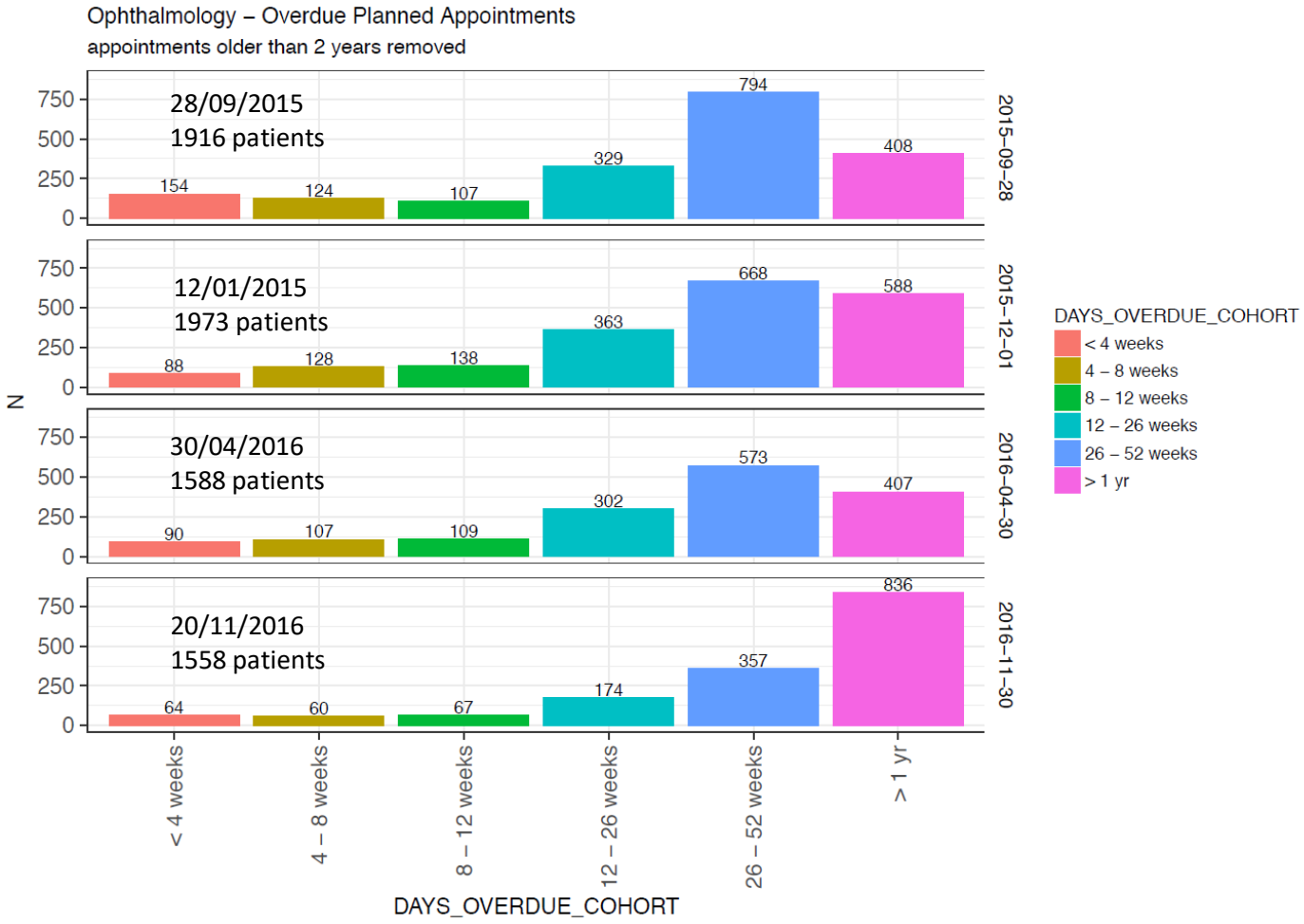


Figure 6.19 Ophthalmology overdue appointments on four census dates

6.4 Summary

Of the 25 different initiatives on the *Ophthalmology Clinical Redesign Group Action Plan*, fourteen were completed. Six of the 12 initiatives added after March 2015 were also completed. Some of the

early projects were a combination effort between the four initial Working Groups; these were governance issues (ratifying the existing DNA policy and updating two GP correspondence letters).

There were two main themes identified as priority areas for clinical redesign:

- patient flow during clinic; and
- clinic demand and patient access.

The three largest bodies of work undertaken was ceasing the diabetic retinopathy screening service; streamlining the appointment codes (e.g. deleting the "EYE03" appointment code) and changing the method of paediatric appointment allocation. This work required extensive stakeholder engagement, months of planning and auditing, and additional diabetic retinopathy screening clinics to clear the backlog of patients who were overdue an appointment. Even though more appointments were created by an additional intraocular injection clinic and allocated appointments were established for post-operative and emergency patients, staff feedback suggested that there were still not enough appointments available for emergency and macular degeneration patients.

The DNA rate did not change during the study period, with the paediatric population having the highest DNA rate. Due to the delayed alteration in the way paediatric patients were allocated appointments, the impact on the DNA rate could not be measured.

Although the Ophthalmology discharge guidelines were not completed, there appeared to be an increase in the discharge rate, as evidenced by the 285 additional discharges from the diary of the project support officer.

Inconsistent data was also the reason the hospital and patient cancellation rates were unable to be reliably calculated. The HSI data analysts were initially unaware of the extent of the data integrity issues which came to light after continued discussions with the hospital clinical and clerical staff.

The alteration of the referral triaging method during the Pre-study phase was a larger than expected impediment on attributing a change in patient flow to the redesign program. The fall in the number of category 1 referrals from November 2014 onwards assisted to decrease the median wait time to

the first appointment for category 1 patients. Conversely, the high number of category 3 patients already on the wait list at the start of the Intervention period contributed to the large increase in the median waiting time of this patient group during the Intervention period. There was a modest improvement in the waiting times of category 2 patients.

The physical layout of the Ophthalmology clinic remained a barrier to effective communication. The clinical and nursing staff had to leave their working area to converse with the other. The disagreement as to where the printer should be situated was an example where tensions in the clinic were so high, the project officer thought that the Ophthalmology clinic staff may withdraw from the redesign program. As patients were not required to walk past the reception area on their way out of clinic, this possibly contributed to incomplete patient data entry and an inaccurate discharge rate calculation.

The separation of the clinical and clerical staff also contributed to patients becoming 'lost' in the clinic waiting area. The investigation of this problem resulted in the development of the "Fast Track Review" card aimed at decreasing any unnecessary patient waiting between the final eye test and medical consultation.

Like the Plastic Surgery Working Group, this redesign program provided both an environment and permission to change. The staff embraced the opportunity to discuss issues at the Working Group meetings (held at 7.30 am in winter) to attempt to resolve many of the uncovered problems. This was the reason why so many items were added to the redesign agenda, as this was a significant opportunity for this group of staff members to meet and discuss issues of importance. Even though many of the initiatives were still incomplete at the end of the data collection period, the Working Group continued their activities for at least one year after the HSI-sponsored activities ceased.

To accurately capture the accomplishments of the Working Group, the change in patient flow in the Ophthalmology Outpatient clinic should not be measured by the pre-determined metrics of:

- Percentage of patients who waited longer than the clinically recommended time before attending their first outpatient appointment by triage category;

- Median wait time to the first appointment by triage category;
- Did Not Attend (DNA) rate;
- Discharge rate;
- Hospital and patient appointment cancellation rates; and
- Number of overdue follow-up appointments

Instead, the change in patient flow should be assessed by the outcome of the audit process and the cessation of the diabetic retinopathy screening service (Table 6-13). The staff were aware of the growing demand of clinic services due to new treatments for macular degeneration and diabetic macular oedema and were responsive to the large number of patients overdue for a follow-up appointment. The audits were the culmination of a concerted effort to understand their patient group and provide the best care using the available resources.

Table 6-13 Outcome of the Ophthalmology clinic wait list and diabetic screening audits

Audit type	Removal from wait list	Current patients discharged	Patient history incorrect and updated	Required further clinical auditing	Allocated an appointment	Total patients
General adult wait list	16	25 (duplicate entries removed)	29	38		118
Diabetic retinopathy screening	32	285			215	532
Paediatric patients	41			38	122	201
Totals	**89**	**310**	**29**	**76**	**337**	**851**

A total of 851 patients either on the wait list or current clinic patients had their files reviewed as a direct result of the program, which is the best indication (given the data analysis constraints) of the success of this redesign program. Each of these 851 patients directly benefitted from the program, either by not being asked to attend a clinically unnecessary appointment, having a correction made to their patient file, or being allocated an appointment.

7 Results: Thematic analysis

This chapter presents the results of the thematic analysis. As described in Chapter Three, the data was coded for the facilitators and barriers associated with the implementation of the redesign initiatives to answer the second research question:

What are the factors influencing the implementation and success of the redesign initiatives?

Three overarching themes were identified: Context; People; and Process. The themes and corresponding sub-themes are summarised in Table 7-1. The complete Thematic map that shows the analytical process (with codes and examples) is presented in Table 7-2 (p.190).

Table 7-1 Summary of Thematic map findings

Theme: Context	**Theme: People**	**Theme: Process**
Sub-theme	**Sub-theme**	**Sub-theme**
Physical space	Human capital	Prioritising
Ownership and governance	Local engagement	Evaluation
Funding arrangements	Understanding	Timing
Available data		Accountability and responsibility
Permission		Broader stakeholder engagement
		Communication

The theme of Context describes how the local factors, specific to this unique redesign program, influenced the implementation and success of the staff-led interventions. The theme of People highlights how people (staff, patients and other stakeholders) are central to the success of redesign programs. Process was the largest and most diverse theme, which illustrates the importance of project management complications as a barrier to the implementation and success of redesign initiatives.

7.1 Context

This theme describes the impact the local context had on the implementation and evaluation of the project. Context is divided into the following sub-themes: physical space, ownership and sponsorship, and funding arrangements and available data.

7.1.1 Physical space

The effect of the physical space on the project was noticeable because the layout of the two clinics were vastly different. The Ophthalmology reception area was separated from the clinical area by a long corridor, whilst the reception area was part of the clinical area in the Plastic Surgery clinic. The Plastic Surgery reception staff were often observed in the clinical area discussing patient details with the clinical staff. The Ophthalmology reception staff either had to telephone the clinical staff or wait until there was a second receptionist and then walk around to the clinical area. Additionally, due to the narrow corridors and staff flow in the clinical area, there was no suitable location for the patient sticker printer to satisfy all members of the Ophthalmology clinic staff. The clinical staff wished for the printer to be situated in the reception, whilst the reception staff argued for the printer to be placed in the clinical area.

Patients at times became “lost” in both clinics, which could in part be attributed to the layout. One of the purposes of the ‘helicopter’ model was to overcome a lack of visual cues when a patient was waiting alone for a doctor in a consulting room. The ‘helicopter model’ also aided nursing staff flow, as allocating the nurses to rooms (instead of all the nurses being responsible for all the rooms) allowed more time to be spent on clinical duties. The orange ‘Fast Track Review” card in the Ophthalmology clinic was also a method of indicating to the medical staff that a patient was sitting in the (sometimes crowded) waiting room ready for their final consultation.

The physical space also impeded patient registration and departure from the clinics. In the Plastic Surgery clinic, the reception clerks were often overburdened by many patients arriving at once from the crowded lifts. The Ophthalmology patients often did not return to the reception desk at the end

of their appointment, as it was not located close to the lifts. This may have contributed to the lower than expected discharge rate because the patients did not take the discharge paperwork back to the reception area.

7.1.2 Ownership and governance

This sub-theme examined how management decisions, as well as the ownership of the initiatives, impacted the study. Ownership and governance includes three subthemes: consistency of governance, ownership of the changes and loss of ownership.

The program took place during a period of major instability in Tasmania's health system. From the launch of HSI in August 2014, to the end of data collection in June 2016, the RHH had three Chief Executive Officers. Also, in July 2015 the three health governing bodies combined to form one state-wide health bureaucracy. Despite the outpatient redesign project sponsor (a senior nurse) remaining unchanged throughout this period, the ethics-approved Pre-study staff surveys across all the redesign programs in the RHH were disallowed by the then CEO. The post (Intervention) staff surveys were permitted after a change of CEO in May 2015.

There was also initial management support for two initiatives which did not proceed ('Physio first' and the 6-monthly wait list audits of all clinics). Despite initial sponsorship, management did not provide additional staffing to allow these projects to advance.

The Working Group lost ownership of the nurse-led clinic when the start date was brought forward by management. There was only one week between the decision to open the clinic and the first session. The clinic opened without a discharge policy and a robust referral system and, consequently, some patients attended their appointment without a plan as to what was required during the consultation. The hasty implementation resulted in the 72% of staff agreeing with the statement, "the nurse-led clinic is underutilised." This loss of ownership during the implementation process resulted in a clinic that was endorsed by staff but was not operating at full capacity.

The Ophthalmology Working Group also lost ownership of where to situate the new patient sticker printer. In the Plastic Surgery clinic, the stickers were printed out to the common clinical area and were collected by the nurse-in-charge and placed in the "arrived" tray in order of each patient's appointment time. In the Ophthalmology clinic, there was no common clinical area for placement of the printer. The printer was ordered during the 2-day workshop by the administration staff manager without collaborative discussion. The Ophthalmology staff were informed by "I have just ordered you a printer", on returning from the lunch break on day 1 of the workshop. On arrival to the hospital, the printer was situated in the un-manned photocopier room unbeknown to the Working Group. The clinical staff complained that the printer was causing unnecessary work as it required continuous checking and it regularly ran out of paper. This contributed to delays to patient care because when the printer ran out of paper the clinical staff were unaware that the patient had arrived in the clinic.

After an agreement was reached to move the printer, the unit management requested HSI to cover the costs of the new Ethernet connection 'because it was a redesign initiative'. The printer eventually was returned to the reception area, after which the project officer noted that the stress among the clinical team members significantly decreased. There were concerns amid the program staff that the Ophthalmology clinic would cease participation in the redesign program if the 'printer problem' was not resolved.

All the other solutions implemented were identified by the Working Groups, which gave them a sense of ownership and commitment to the change process. The Plastic Surgery clinic staff agreed with the observation that patient flow was hampered by junior medical staff requiring advice from senior colleagues and queuing in the staff working area (whilst leaving their patients unattended in the consulting rooms). The solution (the 'helicopter' model) was so effective that the staff adapted the model to include a nurse 'helicopter' and, depending on which consultants were present, up to two consultants were assigned as the 'helicopter' during the same clinic session.

7.1.3 Funding arrangements

This sub-theme discusses the funding arrangements which in turn affected the administration and timeline of the program. There were three organisations directly involved in the program which was federally financed but managed by the University of Tasmania (who directly employed the data analysts and the Lean mentor). There were time pressures to commence and complete the program, as it was six months behind schedule when HSI took over. The redesign project officer and support officer were recruited internally by the hospital, and due to delays in the human resources (HR) processes, the support officer did not officially commence duties until three months into the Intervention period. However, the support officer did attend the 2-day redesign workshop in the capacity of an outpatient clinic clerical staff member. Also, due to recruitment delays at the RHH, the project officer commenced employment only one month prior to the 2-day workshop, which caused undue pressure to study and understand the background issues for each participating clinic.

The well-funded program enabled the hospital to send the clinic staff and management to the 2-day workshop (with the RHH positions back-filled when requested). The resourcing also allowed the data analysts to provide real-time data dashboards to all the Working Groups every two weeks, with additional analysis if required. Without the HSI data analysts, the Working Groups would not have been provided with the comprehensive data dashboards by the RHH.

7.1.4 Available data

This sub-theme describes how the hospital raw data was analysed in detail by HSI and the impact the quality of this data had on the results. The RHH supplied HSI with raw appointment and wait list data. Initial background analysis performed in conjunction with the RHH was able to identify outpatient clinics which were suitable for the program. Subsequent in-depth data auditing by the researcher judged the discharge and appointment cancellation rates to be invalid due to poor data quality. After discussions with the data analysts and hospital staff, it was decided to not use the change in discharge and appointment cancellation rates as an evaluation outcome. It was found that the appointment

and wait list data was not used by the hospital as a measure of performance, and the supplied data required auditing before any analysis was undertaken. An investigation by the researcher of publicly available outpatient wait lists in other hospitals around Australia showed that the quality of the data is inconsistent between the states. It was also identified that there was little incentive for hospitals to provide detailed wait list information as this was not a Commonwealth reporting priority.

7.1.5 Permission

The level of permission required to make alterations to clinic processes was different for each initiative. Small changes to a process which only affected a few staff members could be agreed upon amongst themselves e.g. clerical staff screening telephone calls for the nursing staff. At the other extreme, permission from the Health Minister was needed to close the diabetic retinopathy screening service. The analysis of all initial ideas, through to the implementation of the initiatives (successful or not), highlights the fundamental importance of permission to enable change. Permission began with hospital management allowing the project officer and support officer to be seconded from the RHH, as well as with hospital staff attending training in Lean principles during work time. A change in practice by the medical staff permitted the nurse-led clinic and the 'Physio first' programs to commence. Clinic management permitted paediatric (but not adult) patients to be allocated appointments more than 6 weeks in advance but did not permit the use of the ENT waiting room for Ophthalmology patients. With a change of clinic management (six months after the program had ceased), all patients in the Wellington outpatient building were permitted appointments 12 weeks in advance and the Ophthalmology clinic was granted use of the ENT waiting room.

7.2 People

This theme describes the importance of the people central to redesign program success. The sub-themes consisted of: human capital, local engagement and understanding the changes.

7.2.1 Human capital

There were two fulltime program staff to be dedicated to this project, along with two data analysts and a Lean mentor. Additional training in redesign methodology was also offered to all hospital staff. The adequate level of program staff contrasts with several initiatives which were unable to commence due to a lack of hospital staff. The Ophthalmology clinic made a request to hospital management for an extra receptionist and allied health assistant during the Pre-study period. These two positions were filled during the Intervention period which did help ease the pressure on the nursing and clerical staff. The hand physiotherapy clinic experienced a reduction in staff numbers in the three years prior to the program, but patient numbers did not decline. The previous staffing level of four hand physiotherapists was reduced to two by the start of the Intervention period. Despite this, the 'Physio first' program was endorsed by management. A lack of physiotherapists was one of the recognised reasons this program did not treat any patients. Additionally, the 6-monthly audits of the outpatient wait lists did not occur, with management also citing lack of staff.

Two redesign projects were granted extra staff to assist in the redesign initiatives. An extra weekly intraocular injection clinic and additional optometry clinics (as part of the plan to cease the diabetes screening service) where scheduled. Staff survey and Working Group feedback indicated that although they welcomed the extra intraocular injection clinic, staff felt that one extra clinic each week was not enough appointments to meet the increasing demand.

7.2.2 Local engagement

The success of the program required engagement of the Working Groups, nursing, allied health, clerical staff and the doctors. There were many examples of good local engagement. The Intervention period began in April 2015 and both the clinics' redesign meetings were organised for 7.30 am (before sunrise and outside normal working hours), initially every 2 weeks. These meeting were well attended by the multidisciplinary Working Groups, with nursing, allied health, medical, clerical and management all present. Both clinics extended participation after the initial six-month commitment

was completed and continued their redesign program after the HSI-sponsored activities were finished. The major difference between the Working Groups was the Plastic Surgery medical representative ceased attending meetings in August 2015. This lack of medical involvement was perceived by the hand physiotherapists and nurses in the Working Group as a sign that the doctors were not enforcing the use of the post-surgical appointment follow-up guidelines. The senior hand physiotherapy staff were frustrated by the lack of additional physiotherapists combined with the excessive number of follow-up appointments, without considering the daily clinic capacity.

> "Doctors may request a 2-week r/v (review) but unaware of clinic capacity reduction - when in fact a 3-week r/v (review) may be OK for a particular patient" (Physiotherapist)

7.2.3 Understanding

This sub-theme contrasted examples of where there was either a poor or a good understanding of clinic processes, or a poor or good understanding of the data.

Not understanding the process describes situations when one staff member was frustrated by the lack of understanding by another staff member to carry out a process correctly. There were various instances of Ophthalmology appointments not being booked correctly and patients presenting to the clinic reception without an appointment on the iPM patient management system. This situation occurred when a GP rang the medical registrars directly and the registrar asked that the patient to present to clinic on the same day. There were also instances when post-operative appointments were organised with the patient but also not registered on iPM. As indicated by the staff survey, the Ophthalmology reception staff were pleased with the decreased number of post-operative patients arriving without an appointment as a result of the program.

Understanding the process details instances where staff fully recognised how a process was affecting the implementation of an initiative. The 'helicopter model' of patient care was established and then refined by the clinic staff to change the number of 'helicopter' doctors according to the staffing level. The Ophthalmology clinic staff acknowledged they had to show some flexibility regarding the new

policy of ward patients attending the clinic. They understood the ward staff could not always send patients to the outpatient clinics at their exact appointment time. The Working Groups were very mindful to share the policies they had written, or to ask for input from the other clinics where they thought the policies may be eventually implemented. The new DNA policy and changes to the GP referral acknowledgement letter are examples of policies implemented in other areas not included in the redesign program.

Not Understanding data describes how the staff dealt with the extensive amount of performance data not previously available. At times there was confusion around the meaning and the relevance of the data. At the 2-day workshop a medical representative from each clinic was required to present the activity summary of their clinic over the past 12 months. This information included: number of bookings per month, DNA rate, discharge rate and cancellation rate. The data was collated and presented as a graph by the HSI data analysts. The project officer then gave the graphs to each doctor to include as part of their slide presentation. As each physician gave their talk, 3 out of the 4 doctors (aside from the Ophthalmologist) commented that they were not familiar with the data presented on the activity summary (Figure 7.1).

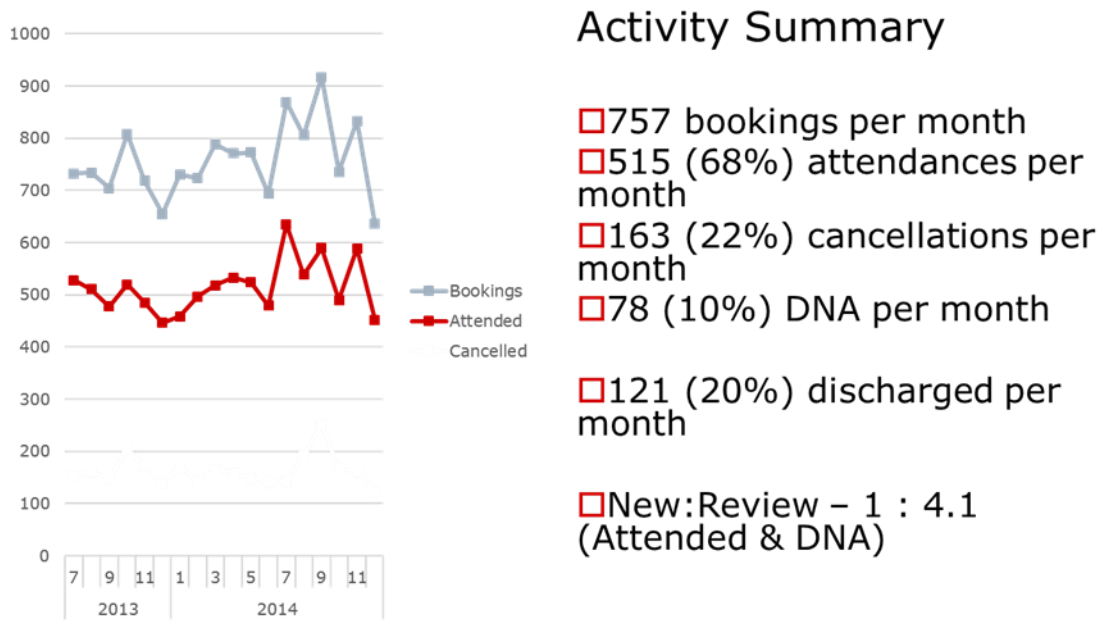


Figure 7. 1 An example of an outpatient clinic activity summary

The HSI data analysts did not meet personally with the physicians before the workshop and were not in attendance during the physician presentations.

Another example of the staff not fully understanding the presented data occurred during the last Ophthalmology Working Group meeting. The researcher asked one of the regular Working Group members why they thought the number of patients had decreased on the Ophthalmology wait list during the study (and showed them the current wait list graph on the data dashboard). The staff member replied, "I don't understand the graph". The dashboard had been discussed at the end of all the Working Group meetings, but as the Ophthalmology Working Group had a very detailed agenda, the data was often only mentioned and analysed in brief.

Both the project officer and project support officer had a good understanding of the data generated from the iPM patient management system. It was during a passing conversation with the support officer that the researcher was informed the "EYE03" appointment code was artificially inflating the number of Ophthalmology *Attended* appointments and by abolishing this code, the number of *Attended* appointments would be correct. It was common knowledge among the administration staff that some of the information generated from the iPM system produced inaccurate appointment data. It was also the support officer who requested the researcher to "Ask me before you use any results from iPM".

Another example of understanding the data was when the Ophthalmology Working Group alerted the project officer to the increased number of overdue follow-up appointments which occurred during the study. This metric turned out to be a very important indicator of patient flow and shows a thorough understanding of how patient appointments are allocated. Importantly, this discovery led to the other clinics also asking for their overdue appointment numbers to be monitored.

7.3 Process

The third and final theme was process. This was the largest and most diverse of all the themes as nearly all the initiatives were affected by a process issue.

7.3.1 Prioritising

The sub-theme of prioritising was divided into defining the scope, and the resultant overburden of not having a tightly defined project scope.

Due to a high level of engagement in the program and with ambitious expectations, the Ophthalmology Working Group started with 25 problems to be resolved. Another 12 were then added during the Intervention period. Only 20 out of 37 issues were resolved (according to the redesign meeting agenda notes) at the end of the data collection period. The scope of the project was defined during the 2-day workshop as 'all the steps between the receipt of the referral and transfer of the patient back to community care.' When all the problems were collated from the 2-day workshop, the list was not prioritised except for ceasing the diabetes screening service. The Working Group meetings became de facto staff meetings, as issues concerning the day-to-day running of the clinic were discussed in addition to the redesign goals. Consequently, the Lean mentor decided to commence coaching sessions with the program officer to provide instruction as to how to divide problems into redesign issues and those which should be handled by the Nurse Unit Manager.

As there were many items on the Ophthalmology redesign list, the full agenda was not discussed during the 60 minutes allocated for each meeting. The redesign meeting length decreased from 60 minutes to 30 minutes after the first six months. The meetings were also originally held every 2 weeks, which then increased to monthly. This resulted in many agenda items not being discussed for months at a time towards the end of the study. This problem was exacerbated during the school holiday periods, when there was no medical representative present at the redesign meetings. The overburden was also intensified when four additional outpatient clinics entered the redesign program in October 2015 (the other clinics remained). The workload for the program officer and Program support officer was effectively doubled after October 2015.

The Plastic Surgery Working Group was not overburdened by a large number of redesign agenda items, but the support which was offered by the program officer and support officer also decreased

when the other four clinics entered the program. After the first six months of meetings, the meeting duration decreased to 30 minutes each month.

7.3.2 Evaluation

This sub-theme covers the types and extent of the evaluations in both the Pre-study and Intervention periods, as well as the factors which impeded a full assessment of the program.

As previously stated, the Pre-study staff surveys were not permitted, and the patient surveys did not replicate the areas of discontent which had been measured by previous in-house questionnaires. The reason for this inconsistency is possibly that only 4 out of 46 patients (9%) who completed the Plastic Surgery outpatient Pre-study survey waited longer than 6 weeks before attending their first appointment. Most of the patients surveyed were classified as triage category 1 or were admitted via the emergency department because of an accident and returned to the clinic for a post-operative appointment (by-passing the wait list).

The most valuable information from patients was gathered during the informal discussions when distributing the surveys to the Ophthalmology patients in the waiting room. Many patients remarked that they were happy with the clinical care received (as backed up by the survey results – in Appendix (vii)), but they were unhappy about the time spent waiting during their appointment. As only one week was available for these surveys (prior to the 2-day workshop), there was not enough time to adjust the questions to reflect this grievance. Another evaluation issue uncovered during the Pre-study period was a problem with data integrity. The raw appointment data supplied by the RHH required cleansing and verification by both the data analysts and clinic staff prior to the final analysis.

The Working Group meeting agenda template contained a column titled “KPIs/Measures” in which the method of evaluation of each initiative was to be documented e.g ‘New DNA policy’ had the corresponding KPI of ‘DNA rate’. The information in the “KPI/Measure” column was never altered or updated after the minutes of the first redesign meeting were circulated to the Working Group members for both clinics. The DNA rate was never written on this document or referred to in the

redesign meetings. The staff were not accustomed to routinely monitoring the changes they made. After the second group of clinics joined the program, the project officer had even less time for evaluation as there was an impetus to finish the implementation of the initiatives in all eight clinics.

The staff surveys and the Ophthalmology Working Group meetings at the end of the Intervention period uncovered previously unknown areas of discontent regarding some of the initiatives. This could signify either a lack of internal evaluation by the Working Group or an increased confidence to show dissatisfaction which only appeared towards the end of the study. It was only at the final Working Group meeting that one staff member remarked that the purple folder (used to enclose a paediatric patient's notes) had the unintended consequence of allowing staff members to knowingly avoid the folder and thus not examine children. In the earlier redesign meetings, time was not allocated to the discussion of the success or problems with any of the initiatives. In each of the Ophthalmology Working Group meetings there was not enough time to discuss all the items on the agenda.

One of the changes made involved the clerical staff screening the telephone calls for the nursing staff in Ophthalmology clinic. The nursing staff were expected to collect the messages at the end of each clinic session. This initiative only lasted a few weeks before being ceased by the clerks because the nurses did not collect the messages from the reception staff. The Working Group did not know that the practice had ceased, as it had not been discussed at the Working Group meetings.

7.3.3 Timing

This sub-theme discusses timing problems at the beginning of the program and provides examples of 'good timing' and 'lack of time' at distinct moments during the study.

As detailed previously, the program officer was recruited one month prior to the 2-day workshop and the Program support officer commenced employment after the program had started. Also, during this month, HSI hosted an international clinical redesign conference (Sustainable Healthcare Transformation Conference, March 2015, Hobart), which many of the hospital staff (including working group personnel) and HSI program staff attended. The week following the conference (and one week

before the clinical redesign workshop) ethics approval was granted to commence the patient surveys. These activities cumulated in a rushed start to the project.

The Plastic Surgery nurse-led clinic also had a rushed implementation - there was only one week between deciding to commence the clinic and accepting the first patients. This contrasts with the cessation of the diabetes screening service, which was well planned and the letters informing the community stakeholders of its progress were sent at the agreed times.

The new policy to ensure that patients who arrived from the local prison could be seen at the start of a Plastic Surgery clinic session (as they were not permitted to be seated in the waiting room) was immediately successful and no further complaints were received from clinic staff.

As the redesign program was extended from October 2015 to June 2016, there was not enough time to fully evaluate the effect of some initiatives (e.g. all paediatric ophthalmology patients allocated an appointment date). The initial research plan was to assess the changes and then monitor the sustainability of the changes over the following eight months.

7.3.4 Accountability and responsibility

This sub-theme focusses on the accountability for completing items according to the minutes of the redesign meetings and determining responsibility for decision making as part of the change management process.

Both redesign clinics had many agenda items to discuss at the meetings. Some agenda items did not progress for months e.g. *Community guidelines for chronic eye conditions*, *Discharge protocols for Ophthalmology clinic, Guideline for triaging ophthalmology referrals* and *Post-operative guidelines for Plastic Surgery patients*. As the working group members were working on several initiatives at once, there did not appear to be a problem when multiple items were carried over from one meeting to the next. It was left up to each staff member to be self-accountable for their agenda item.

At times there was confusion surrounding who was responsible for task completion or who was responsible for making a decision. The outpatient clinics did not have a governance committee during the program. This proved troublesome for the project officer when one of the clinics made a process change and then required advice as to whether to distribute the guidelines to other clinics. The Ophthalmology Working Group composed guidelines for the safe transfer of patients between the inpatient wards at the RHH and the outpatient clinics. This guideline was not implemented, awaiting advice from the Nurse Unit Manager, who was on leave.

An audit of the Ophthalmology wait list was required as part of the initiative to cease the diabetic retinopathy screening service. This was performed by the project support officer. No audits were conducted by the Plastic Surgery Working Group. During the 2-day workshop, management committed to regular 6-monthly audits of all outpatient clinics' waiting lists. No 6-monthly audits were completed for any clinic during the 15-month Intervention period, citing lack of staff from clinic management. This created confusion and tension between management and the program staff surrounding whose role it was to perform audits during the program.

7.3.5 Managing guidelines

This theme is concerned with problems of location and placement of new guidelines and the new clinic services that commenced without any guidelines.

Writing guidelines for new or altered processes was a function of the redesign program. Initially, all the clinics were interested in exploring whether they were abiding by the current DNA policy. Locating the DNA policy was difficult as the clinic staff were not used to sourcing information electronically. When found, the DNA policy, although completed, had not been formally endorsed by the hospital executive. The policy then took four weeks to be approved and to be circulated to all the outpatient clinics at the RHH. When surveyed, only 45.5% of the Plastic Surgery staff were aware of this DNA policy and 14.2% of the staff replied that they had read the policy.

When all the new Plastic Surgery clinic guidelines were complete, there were discussions among the Working Group members concerning where to store them. The hospital had a *Guidelines Committee* which approved guidelines and uploaded them to the hospital intranet, but the Working Group decided this process took too long. The new guidelines were not written on the official guideline/hospital template. The guidelines were eventually placed as a hard-copy in a flip display folder in the common staff working area and given to the new doctors when they commenced their rotation as a member of the Plastic Surgery team. The guidelines were not stored electronically and were not available inside the consulting rooms.

As many of the operational details of the nurse-led clinic were not finalised before its implementation, there was confusion among the staff about whether this clinic could discharge patients. In the survey, 8 of 22 staff agreed with the statement 'The discharge guidelines regarding the nurse-led clinic are clear', despite the guidelines not being written. During one of the final redesign meetings, one of the nurses complained that patients were referred to them with no direction from the medical staff on what was required during the appointment. The same nurse then implemented a comprehensive referral form for the physicians to complete, which one month later was deemed to be successful. Overall, both Working Groups had trouble locating a suitable hospital template to write guidelines, determining the best method of disseminating the information and then how to store them so the staff could utilise them effectively.

7.3.6 Broader stakeholder involvement

This sub-theme centred around the Working Groups' engagement with wider stakeholder parties when planning and executing the changes. Consultation with groups outside the hospital was thorough and well-received. The change in post-operative appointments with the private theatres decreased the number of unexpected appointments according to the booking clerks. The GPs appreciated the correspondence letters which conveyed the triage category of the referral on feedback from the GP liaison officer. The engagement with the community optometrists and

ophthalmologists was thoroughly planned to ensure all patients on the wait list were screened (for diabetic retinopathy) by either the Ophthalmology clinic or in the community. The RHH consumer group was consulted when signage and public notices were produced for the Ophthalmology clinic.

There was mixed feedback on the engagement outcome from other parties inside the hospital. The wards agreed to change the way post-operative Plastic Surgery clinic appointments were allocated after a thorough audit of how many patients this change in process would affect (and how much burden this would place on the ward staff). Even though all children in the Ophthalmology clinic were allocated an appointment date after receipt of a referral, after initial consultations involving the paediatric social workers and the GP liaison officer the negotiations stalled. At the time of writing this thesis the policy was still not finalised, which has not pleased the paediatricians (personal communication).

7.3.7 Communication

This sub-theme discusses communication between the Working Groups and three separate parties – community partners, staff and patients.

All the community stakeholders were well informed about the changes resulting from alteration in both clinics' processes; this included the private operating theatres, GPs and private optometrists and ophthalmologists. The staff surveys revealed the most positive change in communication was with "staff within your discipline" (at the RHH). More than half the staff surveyed felt there was no change in communication with patients.

The 2-day workshop and subsequent meetings provided an additional opportunity for communication between the multidisciplinary staff members. For some staff it was the only opportunity to discuss issues as many staff were part-time in the clinic and were only present for their rostered shifts and left immediately after. When staff were questioned about specific projects, communication problems were a common feedback topic:

- the orange “Fast Track Review” card was ignored by casual staff who had not been informed of its use;
- Plastic Surgery clinic nurses were dissatisfied with the lack of information provided by the nurse-led clinic referral form;
- a Plastic Surgery booking clerk was unaware of the ‘Physio first’ model of care; and
- one of the Plastic Surgery registrars was not informed of the new DNA policy (even though it was the role of the registrar to complete the DNA paperwork).

The communication between the Working Groups and the community stakeholders was almost always planned carefully, with all correspondence undergoing several draft versions before being mailed on official hospital stationery signed by senior clinicians. This is in contrast to communication with the hospital staff. Once a process was altered, the meeting minutes frequently included the phrase “Needs socialising of agreed process”. Communication strategies for informing staff of changes were ad-hoc and unplanned. It was common to discuss the need for “socialising” a new policy during meetings which then relied on the working group members informing the staff about the progress of the initiatives.

Communication proved more difficult than the Working Groups anticipated due to the mobile working conditions of the staff. This issue was highlighted when the allied health staff members were presented with the opportunity to learn how to use the iPM patient booking system in the Ophthalmology clinic. Only one staff member utilised the training as the others were not available outside of their clinic sessions.

Table 7-2 Thematic map

Examples	Code	Sub theme	Themes
1.11 Ophthalmology reception separate from clinical area	1.11 Physical separation	1.1 Physical space	1. Context
1.12 The was nowhere the printer could be placed which was agreeable to all staff	1.12 "The printer"		
1.13 Ophthalmology patients were 'lost' during clinic sessions and staff unaware	1.13 Patients 'lost'		
1.13 Plastics patients 'lost' when nurse left room and could not find an available Dr			
1.14 Ophthalmology patients not returning to reception because not near the lift	1.14 Patient registration		
1.14 Many Plastics patients entering reception area from lift at same time – overburden			
1.14 Patients leaving and entering Plastics reception at same time			
1.15 Nursing staff flow improved after "helicopter model" introduced	1.15 Staff flow		
1.21 Pre-study staff surveys not allowed after initial agreement	1.21 Consistency of governance	1.2 Ownership and governance	
1.21 Wait list audit agreement, but did not occur			
1.21 Management support for 'Physio first' but no additional funding			
1.21 Four CEOs during study			
1.22 Nurse-led clinic commenced by management and not working group	1.22 Loss of ownership		
1.22 Initial printer placement decided by management			
1.22 Disagreement over who should fund ophthalmology printer relocation			
1.23 Most problems and solutions identified by working groups	1.23 Ownership		
1.31 Commonwealth provided original funding via HSI to RHH	1.31 Complex funding	1.3 Funding arrangements	
1.31 HSI funded program staff, but employment contract was with RHH			
1.31 HSI provided Lean mentor and data analysts external to hospital			
1.41 Data generated from wait list and outpatient appointments not "cleaned" by RHH	1.41 'Dirty" raw data	1.4 Available data	
1.41 Discharge and appointment cancellation rate could not be calculated accurately			
1.42 Outpatient wait time data not monitored by Commonwealth	1.42 No incentive to clean data		
1.51 Diabetes screening change permitted by health minister	1.51 Health minister permission	1.5 Permission	
1.52 Children (but not adults) can have appointments scheduled more than 6 weeks in advance	1.52 Partial permission		
1.53 Management allowed hospital staff to be seconded to program	1.53 Management permission		
Lean training allowed for hospital staff in work time			
1.54 Drs permitted nurse-led clinic and 'physio first'	1.54 Dr permission		
1.55 Researcher required Working Group, clinic staff and patient permission	1.55 Research permission		
2.11 "lack of available physios"	2.11 Not enough hospital staff	2.1 Human capital	2. People
2.11 "no adequate staff for implementation"			
2.11 "not enough staff to perform wait list audits"			
2.12 Additional eye injection clinic + additional optometry clinics	2.12 Additional clinics		
2.13 Lean training for hospital staff	2.13 Training for hospital staff		

2.14 Two full-time program staff trained in Lean + data analysts + Lean mentor	2.14 Many program staff		
2.21 Working Groups attended meetings in own time on dark winter mornings 2.21 Working Groups continued after HSI sponsorship ended 2.21 Working Groups extended involvement in program 2.21 Working Groups were multidisciplinary 2.22 Eye Dr worked on policies in own time 2.22 Eye Dr volunteered for multiple tasks but was unable to complete some of them 2.22 "Drs need to let go of the need to see results of simple procedures" (Plastics) 2.22 "Drs not sticking to the policy" (Plastics) 2.22 Plastics Drs stopped attending meetings mid-project 2.22 Very positive Dr feedback for 'Physio first' 2.23 Staff willing and able to work extra shifts 2.23 Eye clinic staff often asking program staff for advice	2.21 Working group engagement 2.22 Dr engagement 2.22 Staff engagement	2.2 Local engagement	
2.31 "triage of referrals not completed properly" (Plastics) 2.31 GPs contact clinic registrars directly and book in patients without notifying reception 2.32 'helicopter' model adopted and refined by Plastics staff 2.32 acknowledging that ward staff can't always transport patients at agreed times (Eyes) 2.33 "I don't understand the graph" 2.33 "I have never seen this data before" 2.34 "Ask me before you use any results from iPM" 2.34 Abolishing 'Eye03' appointments to improve data integrity and true clinic capacity 2.34 Recognising the number overdue follow-up appointments should be monitored	2.31 Not understanding the process 2.32 Understanding the process 2.33 Not understanding the data 2.34 Understanding the data	2.3 Understanding	
3.11 Initiatives added before others were completed (Eyes) 3.11 Many initiatives were unfinished at end of data collection period (Eyes) 3.12 Did not discuss all agenda items during clinic meetings (Eyes) 3.12 Extra burden for program staff when 4 additional clinics entered program 3.12 "Paperwork behind…no staffing allocation" for extra intraocular injection clinic	3.11 Defining scope 3.12 Overburden	3.1 Prioritising	3. Process
3.21 Informal discussions with patients highlighted concern with waiting time in clinic but not with clinical care 3.21 Due to 'dirty' raw data the pre-study analysis was repeated 3.22 "KPI" column on agenda notes never used by any working group 3.22 Working group unaware clerks stopped taking telephone messages during clinics 3.22 Staff unaccustomed to evaluating projects 3.22 Working group unaware of purple folders causing some staff to avoid children	3.21 Pre-study assessment 3.22 Post Intervention assessment	3.2 Evaluation	
3.31 Nurse-led clinic implemented with one weeks' notice 3.31 Only 1 week to complete patient surveys	3.31 Rushed implementation	3.3 Timing	

3.31 Program officer only employed 1 month prior to 2-day workshop 3.31 Program support officer employed after program commenced 3.32 Diabetes screening letters sent to community stakeholders at agreed times 3.33 Due to program extension, some initiatives could not be evaluated due to lack of time	 3.32 Good timing 3.33 Lack of time		
3.41 Items left on agenda for months with no action 3.42 Protocol not rolled out because may be used in other clinics and manager away 3.42 Confusion whether program or clinic staff tasked with wait list audits	3.41 Determining accountability 3.42 Determining responsibility	3.4 Accountability and responsibility	
3.51 No discharge guideline written for nurse-led clinic 3.52 Nowhere to put new Plastics guidelines 3.53 Where do I find the DNA guidelines?	3.51 Guidelines	3.5 Managing guidelines	
3.61 Agreement from ophthalmologist and optometrists to stop diabetes screening 3.61 Change in GP acknowledgement protocol well received 3.61 Post-operative appointments planned well with external theatres 3.62 Consumer group consulted about patient brochures in eye clinic 3.63 Wards agreed to change method of post-op reviews 3.63 Policy with social work concerning paediatric DNA patients unfinished	3.61 Engagement with community 3.62 Engagement with patients 3.63 Engagement with hospital	3.6 Broader stakeholder engagement	
3.71 All GPs and optometrists in Southern Tasmania well-informed about change in diabetes screening policy 3.72 Orange “Fast track review” card only worked when all staff aware 3.72 “CSOs unaware of the model” 3.72 Program enabled “better communication between clerks and nurses” 3.72 Nurses didn’t know what to do when patients turned up 3.72 “Make Drs aware of reduced clinic on weeks where a public holiday falls” 3.72 Only one allied health staff member trained to access iPM due to being part-time 3.72 “I would fill out the form if I knew it existed” 3.72 “need socialising of agreed process” 3.73 Suggested improvements: “communicating with patients when clinic is running behind” 3.73 Staff survey results: no change in communication with patients	3.71 Communication with community 3.72 Communicating with staff 3.73 Communicating with patients	3.7 Communication	

7.4 Summary

When the qualitative data was coded for facilitators and barriers associated with the implementation of the redesign initiative, three themes were identified: Context, People and Process. The Context included the unique characteristics of this study which included a comparison of the physical layout of the two clinics and also consequences of the complex funding arrangements and data analysis problems. The People theme described relationships between HSI, the Working Groups and the hospital and other community members involved in the project. Process explained the project management issues encountered as the Working Groups made changes to their workplace.

The findings from the Thematic map did not adequately describe the importance of timing and order in the change process. After comparing the results of the Plastic Surgery and Ophthalmology clinics redesign program, the following chapter includes the construction of a redesign process map. The process map highlights the need for each step to be completed, in order, before embarking on the next step. If all steps in the process map are considered, then the influence of local context will be included automatically in any redesign project.

8 Discussion

This chapter firstly compares the project characteristics of the two outpatient clinics in order to make suitable comparisons between the clinics' results. A generic process map for redesign methodology is proposed with emphasis on planning and timing. Finally, the complexity of healthcare and the correlation with Lean redesign methodology is examined.

8.1 Comparison between Plastic Surgery and Ophthalmology clinics

Although the clinics had the same nurse unit manager and shared some of the same nursing and administrative staff, appointments were managed differently. In the multidisciplinary Ophthalmology clinic, patients were allocated one appointment per health professional and all the bookings were made by the same clerical team. The hand physiotherapy clinic (located next to the Plastic Surgery Outpatient clinic) managed its own appointments separately from the Plastic Surgery administration staff. This was the rationale behind not examining the physiotherapy appointment statistics in this study.

The Plastic Surgery clinic appointments were generally pre- or post- surgical consultations or skin cancer removal and surveillance. Most of the appointments were scheduled during two large clinics each Tuesday and Thursday. The Ophthalmology appointments were distributed between subspecialties, including cataract, macular degeneration, diabetic retinopathy and a general Ophthalmology clinic (including paediatric patients). Although the Plastic Surgery clinic received more referrals per month, the Ophthalmology clinic had more *Attended* appointments because sessions were scheduled twice-daily on all weekdays and patients had separate booked appointments for each eye health professional. Despite the different types of services offered and patient composition, the redesign project characteristics for both clinics were similar (Table 8-1).

Table 8-1 Characteristics of the Plastic Surgery and Ophthalmology Outpatient clinics

Clinic Characteristics		
	Plastic Surgery	**Ophthalmology**
Patient group	Homogeneous (mostly surgical, some skin cancers)	Heterogeneous (many sub-specialities)
Referrals per month	≈ 160 (Intervention)	≈ 100 (Intervention)
Attended appointments per month	≈ 545 (Intervention)	≈ 725 (Intervention)
Appointment allocation	1 appointment per patient	1 appointment per health professional
Triaging referrals	Stable method of triaging throughout entire study	Three distinct triaging periods during the Pre-study period
% category 1 referrals	68% (Intervention)	35% (Intervention)
Common age range of referred patients	15-70 years	1-10 years and 60-80 years
Redesign Project Characteristics		
	Plastic Surgery	**Ophthalmology**
Redesign priorities	Clinic demand and patient access	Clinic demand and patient access
Physician involvement in redesign project	Doctor ceased attending Working Group meetings mid-way through the Intervention	Constant doctor engagement throughout study
Clinic management support for redesign initiatives	Inconsistent	Inconsistent
Data problems	Patient and hospital cancellation rate unable to be accurately calculated	Known data integrity issues with the method of appointment allocation, discharge data missing and cancellation rate unable to be accurately calculated

The physician involvement on the Plastic Surgery Working Group ceased initially due to a timetable clash with theatre, but the physician attendance at the Working Group meetings did not recommence for unknown reasons. When the medical staff were surveyed on their involvement in the redesign program, one consultant marked the option "participated in the implementation of the initiatives in clinic", one consultant was "given the opportunity to be involved but chose not to" and the other "was not involved but worked in a clinic where change has occurred". This lack of involvement by senior

staff may explain the difficulty perceived by the physiotherapists and nursing staff in engaging the junior medical staff to fully adhere to the new discharge and post-operative patient management guidelines.

In contrast, there was consistent physician involvement with the Ophthalmology Working Group throughout the study. This included compiling and relaying other ophthalmologist feedback to the Working Group when requested. In the literature, physician involvement is noted as important for two distinct reasons - as a redesign team member and secondly as in a local leadership role.[45] Additionally, health professional scepticism of the impact of QI interventions is documented to be a serious barrier to the successful implementation of QI activities. [44]

Another major difference between the two clinics was the consistency of the referrals between the two study periods. The number of referrals accepted to the Plastics Surgery Outpatient wait list was almost identical during the Pre-study and Intervention phases (2412 vs 2417), and the percentages of patients in each triage category were also consistent. This is in contrast with Ophthalmology, where there was a 23% decrease in the number of referrals accepted overall, but a 75% increase in the number of category 2 referrals added to the wait list during the Intervention period (416 vs 726). As discussed in Chapter 6, there appeared to be three distinct periods where the triaging methods were different. The decrease in category 3 referral numbers was originally thought to be due to the change in referral criteria, but the constant high number of category 3 referrals ceased abruptly in July 2014. This was more than one year prior to the clinic closing the diabetic retinopathy screening service (patients with diabetes without symptoms were triaged as category 3).

Aside from different physicians performing the triaging, there may be other explanations for this uneven distribution of referral numbers. In 2015, Tasmania had the highest number of hospitalisations per 100,000 in people aged 40 years and over for cataract surgery (2,520 per 100,000), whilst South Australia had the lowest (1,810 per 100,000) [132] The Australian government provided $1.95m over 3 years (2012-2015) for an additional 975 cataract procedures to be performed by the

Tasmanian Health Organisation - South. [133] Whilst it is unknown exactly when these additional 975 surgeries occurred (the surgeries were performed on public patients in the private hospital system), in 2011 there were 973 cataract operations. The number of surgeries increased each year and in 2014 there were 1565 cataract surgeries in Tasmania. [133] The patients would have all been triaged and placed on the Ophthalmology clinic outpatient wait list before being placed on the Ophthalmology surgical wait list. These patients may have been up-categorised from category 2 to category 1 during the period of June to October 2014 due to this additional funding, which may explain the increase in the number of category 1 referrals to the wait list during this period.

The second possible explanation for the increase in category one patients from July-October 2014 is because intraocular injection treatments for macular oedema, wet age-related macular degeneration, and central retinal vein occlusion were not available at the Ophthalmology clinic until 2014. According to the appointment data, the first clinic to offer these sight-preserving injections began in May 2014. There was a weekly clinic until June 2014, when a second clinic commenced. Previously, these patients were triaged as category 3 as there was no available therapy for these eye conditions at the RHH.

8.1.1 Waiting time comparison

This section compares the changes in patient flow for both clinics as measured by:

- the percentage of patients who waited longer than the clinically recommended time before attending their first outpatient appointment; and
- median wait time to the first appointment by triage category.

When the waiting time results from Chapter 5 and 6 were collated and compared in tabular form, it became apparent that other measures were also required to give a fuller picture of waiting times (Table 8-2).

Table 8-2 Waiting time comparison for Plastic Surgery and Ophthalmology Outpatient clinics

	Plastic Surgery		Ophthalmology	
	Pre-study	**Intervention**	**Pre-study**	**Intervention**
Category 1 patients				
% over boundary*	43.5%	28.6%	67.9%	43.2%
median	8 days	6 days	52 days	27 days
range	0-568 days	0-1085 days	0-1151 days	0-396 days
90th percentile waiting time	74.2 days	48.3 days	135.6 days	165.9 days
Category 2 patients				
% over boundary*	97.4%	96.4%	79%	66.4%
median	560 days	405 days	183 days	123 days
range	5-1288 days	15-851 days	0-1196 days	7-843 days
90th percentile waiting time	620.9 days	515 days	485.6 days	350 days
Category 3 patients				
% over boundary*	91.2%	92.9%	13.3%	57.6%
median	1125.5 days	1038 days	98 days	393 days
range	1-1365 days	67-1317 days	1-1642 days	11-1637 days
90th percentile waiting time	1296.9 days	1272 days	117.6 days	656.2 days

*% over boundary for category 1 patients > 30 days; category 2 patients > 90 days; category 3 patients 365 days

At first glance the Plastic Surgery category 1 median wait times for both study periods seem incongruous to the % over boundary. During the Pre-study period, 43.5% of Plastic Surgery category 1 patients were over boundary, yet the median wait time was only 8 days. The percent of patients over boundary decreased to 28.6% but the already low median wait time decreased marginally to 6 days. This result can be attributed to the types of medical conditions treated and the way appointments were allocated, and patients notified. As half of the referrals were the result of trauma (from the emergency department or GP), these patients were on the wait list for only a few days. If the referrals were received on the weekend, they were only triaged on the following weekdays. Thus trauma (and urgent melanoma) patients were notified of their appointment on Monday from referrals received on the previous Thursday, Friday or the weekend. These appointments were scheduled for either the Tuesday or Thursday of the same week, only waiting a few days from when the referral was triaged to the day of the appointment. The appointments were arranged by telephone; however, less

urgent patients (but still category 1) were notified of their appointment by letter. If the time or date allotted was unsuitable, the patient contacted the clinic and requested a change. By the time a suitable date was agreed upon by both parties the patient may have already been waiting longer than 30 days.

Another reason why it was difficult to have all category 1 patients seen within 30 days is because patients remain on the wait list until they attend their first appointment. This extends the waiting times for patients who may be a no-show for an appointment before eventually attending clinic. A histogram displaying the number of days on the wait list for patients waiting 70 days or less during the Intervention period shows that the most common waiting time was only 1 day.

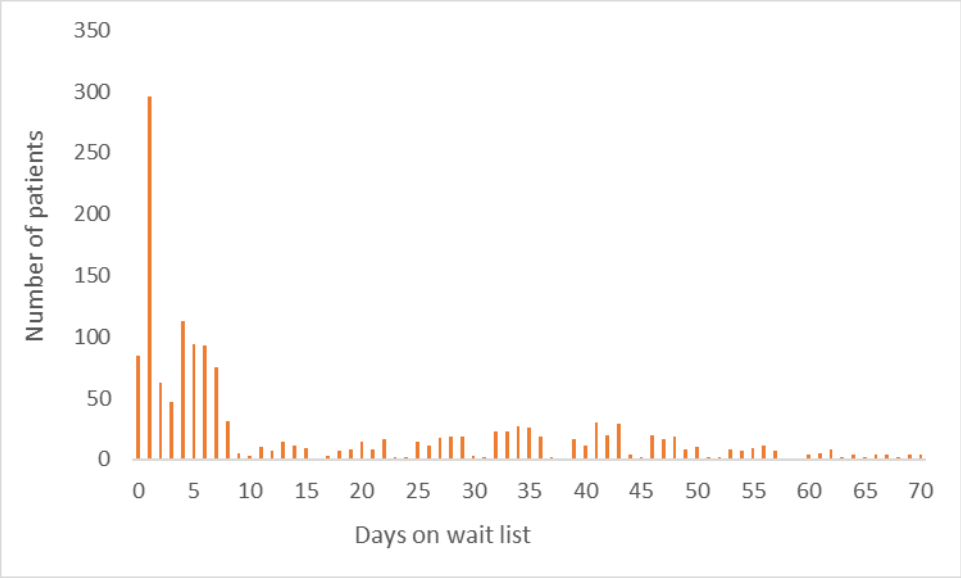


Figure 8.1 Histogram of days on the wait list for category 1 patients waiting 70 days or less during the Intervention period

More than 90% of Plastic Surgery Category 2 and 3 patients waited longer than the clinically recommended time for their appointment during the entire study period. This indicator does not convey the length of time the patients actually waited. Using the median values, the category 2 waiting time decreased from 560 to 405 days, and the category 3 wait times from 1125.5 to 1038 days. Thus, for these patients, median waiting time is a more useful measure than % over boundary, showing that waiting times had fallen considerably for most of these patients, but they were still unacceptably long.

Another significant factor was that the waiting time was not re-set to zero if a patient was transferred from one triage category to another. This is the policy for all outpatient clinics at the RHH. For example, if a patient was waiting 350 days as a category 3 patient and, due to a deterioration in condition, was reclassified to category 1 and attended an appointment after waiting a further 3 days, the wait time was assigned as 353 days in category 1. From the data supplied, it could not be determined how many patients were in this situation. This could explain the large range of wait times for the category 1 patients in both clinics. The longest wait for an Ophthalmology category 1 patient (Pre-study) was 1151 days, but the 90th percentile wait was 135.6 days. Potentially, patients in the top 10% of the longest waiters may have originally been triaged as category 3 and, if so, this practice clearly distorted the category 1 waiting time range.

There are two other factors which may have potentially affected the data reliability.

- It was an RHH policy that time on the wait list should be suspended when a clinic is notified when a patient is not 'ready for care' (not available to attend a specialist outpatient appointment due to illness or other factors); it is unclear if this procedure was followed throughout the study.
- The lower limit of the wait times for category 2 and 3 patients in both clinics suggests that some category 1 patients were incorrectly entered into the booking system as category 2 or 3, or that the category 2 and 3 patients with short wait times jumped the queue.

In summary, all these confounding factors impacted on the waiting time analyses. These findings highlight the importance of understanding the circumstances in which results were obtained. If all the influences affecting the Ophthalmology wait list additions and removals were not considered, it might mistakenly be concluded that the redesign program had a detrimental effect on the waiting times of category 3 patients; when it was in fact due to circumstances occurring months before the program commenced.

8.1.2 DNA rate comparison

Despite the different patient and staff characteristics of the two clinics studied, the overall DNA rates were almost identical (Table 8-3). *New* appointments had the highest DNA rates in both clinics, followed by *Emergency*, then *Review* appointments. The *Emergency* appointments, usually only opened for booking in the two weeks prior to each session, had a similar DNA rate as *Review* appointments. This suggests that the urgency threshold for some of these appointments may be too low, or that the patients may improve in the days after receiving an appointment and subsequently not present to the clinic.

The procedural clinics had the lowest DNA rates of all clinics across both disciplines. In a systematic review of factors that influence DNA behaviour, Dantas *et. al.* also found that procedural clinics had the lowest DNA rates of all clinic types (4%).[134] Patients may prioritise their attendance at these appointments e.g. the intraocular injection clinic may be considered sight-preserving and the skin-cancer clinic as potentially life-saving. In addition, the appointment time and date allocation for these clinics is usually made during a discussion with the patient (with a short waiting time until the appointment), which may also increase the attendance rate.

Table 8-3 Comparison of DNA rates and appointment types between Plastic Surgery and Ophthalmology outpatient clinics

Appointment type	**Plastic Surgery clinic DNA rate**	**Ophthalmology clinic DNA rate**
All (Pre-study)	13.7%	14.1%
New (Pre-study)	22.1%	18.9%
Emergency (Pre-study)	12.2%	14.3%
Review (Pre-study)	11.8%	13.7%
Procedure clinics (Pre-study)	2.4% (skin cancer clinic) 5.1% (nurse-led clinic - Intervention only)	6.0% (intraocular injection clinic)
Paediatric appointments (< 14 years, Pre-study)	20.8% *New* appointments 16.7% *Review* appointments	31.9% *New* appointments 24.9% *Review* appointments

The high DNA rate for the paediatric Ophthalmology appointments was one of the problems highlighted by the Working Group. The plan to decrease the DNA rate by allocating all children an appointment on receipt of the referral was fully implemented in May 2016 – only one month prior to

the end of data collection. The retrospective allocation of appointments for all children on the wait list was almost completed by June 2016, with 38 out of 201 patients still waiting for an appointment date. Due to the length of time taken to complete this initiative, this change in practice could not be evaluated for this thesis.

It was also anticipated that by narrowing the referral criteria and closing the diabetic referral screening service, the overall Ophthalmology DNA rate would decrease. As with the paediatric appointment allocation, the audits involved in this task were very time consuming and the full extent of the changes could also not be measured as it was only completed at the end of the data collection period.

The Plastic Surgery Working Group had two strategies to decrease the DNA rate – scheduling post-surgical appointments prior to discharge and the 'guidelines for clinicians', which outlined the number of post-operative appointments to be scheduled for common operations. Scheduling post-surgical appointments whilst still an inpatient is a proven method of ensuring patients are more likely to attend their appointment.[135] The DNA rate of all *Review* appointments decreased from 11.8% to 10.4%, and the *Review* DNA rate for the combined Tuesday and Thursday hand clinic decreased from 15.6% to 13.1%. It was the opinion of the physiotherapists and nurses that the DNA rate may be decreased further if fewer post-surgical reviews were offered to patients.

8.1.2.1 DNA rate comparison with the literature

The DNA rates for Ophthalmology appointments vary in the literature because many of the indicators used are not comparable. A New Zealand study reported that paediatric patients had a higher DNA rate than adults (18.7% vs 12.4%, p=0.028).[136] Whereas, in a Welsh paediatric clinic, both new and review appointments had a high DNA rate (23.74% vs 22.47%).[137] In a study to link the paediatric DNA rate with the number of appointments post-cataract surgery, Lin *et. al.* found the initial low DNA rate of 2.2% increased to 17% by the fourth appointment. [138]

When age was not considered, some studies reported new Ophthalmology patients had a higher DNA rate [139] but others found return patients with a higher DNA rate. [136, 140] The triage categories of the new patients were not mentioned in the studies.

Investigators have examined a multitude of possible patient and environmental factors contributing to low appointment attendance figures e.g. age, gender, marital status, distance from clinic, weather (temperature, rain), school holidays, religious holidays, day of the week, diagnosis, concurrent illness, forgetfulness and clerical error.[134] In a systematic review of DNA factors, a long lead time (time interval between the date the appointment was scheduled and the actual appointment date) was shown to be the most important predictor. This may not necessarily be true in Tasmanian public outpatient services where the lead time may be relatively short (maximum of 6 weeks in Tasmania due to the method of allocating appointments) compared with the time spent on the wait list before an appointment is offered (months to years).

Published DNA rates for Plastic Surgery/ trauma outpatient appointments also cover a wide range (9.5% - 25.76%).[141-143] An English study which explored waiting time by triage category stated urgent patients (19% of all referrals) had a DNA rate of only 13%.[142] In contrast, this research found a DNA rate of 22.1% for all new urgent patients (61% of all referrals).

An Australian orthopaedic clinic employed three initiatives aimed at decreasing the DNA rate: a new DNA policy, a wait list audit (24% of 1100 patients were removed due to the audit), and a patient-focussed booking system.[144] The authors concluded the new booking system had the largest effect on the DNA rate. Upon receipt of the referral, a letter was sent to each patient inviting them to contact the clinic to arrange an appointment. Patients who responded within two weeks were given the choice of appointment time and date. The patients who did not contact the clinic within 14 days were discharged back to the GP (with the ability to fast-track the discharged patients back into clinic if indicated). After the introduction of the new booking system, the physiotherapist-led clinic DNA rate decreased from 30% to 7.4%, and the surgeon-clinic DNA rate fell from 18% to 7.9%. [144] A patient-

focussed booking system was discussed with the managers and clinicians at the RHH, but it was decided that the risk to the patients was too high if they did not receive or understand the correspondence.

8.1.3 Discharge rate comparison

The discharge rate calculations for both clinics were performed on *Review* appointments only, because this was the appointment type targeted by the program. As can be seen from Table 8-4, the discharge rate of the Plastic Surgery clinic was higher than the Ophthalmology clinic throughout the study. The biggest problem in comparing the results was that 30% of the patients who *Attended* an Ophthalmology appointment (Pre-study) had their appointment outcome data missing, and the Ophthalmology staff believed the true discharge rate to be higher than the calculated rates.

Table 8-4 Discharge rate comparison between Plastic Surgery and Ophthalmology Outpatient clinics

	Pre-study	Intervention
Plastic Surgery clinic		
Discharge rate	24.7%	26.6%
Attended appointments where discharge status was unknown	6.6%	9.2%
Ophthalmology clinic		
Discharge rate	6.3%	8.6%
Attended appointments where discharge status was unknown	30.1%	14.1%

8.1.4 Cancellation rate comparison

Due to the previously mentioned differences in cancelling appointments, the planned measurement of hospital, patient and administration-related cancellations could not be performed. As a proxy measurement of waste, the ratios of *Attended* to *Cancelled* appointments were calculated. As expected, the Ophthalmology measure of waste did not improve because of the high number of '*cancellations*' and re-booking of appointments by the clinical redesign support officer when redundant clinic codes were deleted from the iPM system. This necessary procedure artificially inflated the number of appointment cancellations. There was however a decrease in calculated waste for the Plastic Surgery clinic (Table 8-5).

Table 8-5 Ratio of* Attended *to* Cancelled *appointments for Plastic Surgery and Ophthalmology Outpatient clinics

	Ratio of *Attended*:*Cancelled* appointments		p-value
	Pre-study period	**Intervention period**	
Ophthalmology	2.4:1	2.3:1	> 0.05
Plastic Surgery	3.1:1	3.8:1	<0.00001

8.1.5 Overdue follow-up appointment comparison

As the Ophthalmology working group was the first group to acknowledge the relationship between a decrease in the number of patients on the outpatient wait list and the increase in the number of overdue follow-up appointments, they sought to fix this problem. Through various initiatives, the Ophthalmology staff reduced the list by 385 patients between December 2015 and April 2016. Although the Plastic Surgery Working Group became aware of the issue during the study period, the list increased by 131 patients over the same period. Both clinics committed ongoing resources to the problem, and it was resolved by December 2017.

Table 8-6 Comparison of overdue follow-up appointments for Plastic Surgery and Ophthalmology Outpatient clinics on four census dates

	Number of over-due follow-up appointments (raw data) on four census dates				
	29/09/2015	01/12/2015	30/04/2016	30/11/2016*	**Difference** (Sept 2015-Nov 2016**)**
Ophthalmology	1916	1973	1588	1558	-358
Plastic Surgery	241	352	483	695	454

* The Intervention period officially finished on 30/06/2016, but data was not available on this date.

8.1.6 Summary

There were so many changes occurring simultaneously, and because of the data reliability problems it is hard to answer definitively if there was a definite improvement in all aspects of patient flow through the outpatient clinic system due to the program. The benefits in a decreased time on the outpatient wait list for some patients were offset by a longer wait for follow-up appointments for other patients. Braithwaite advises that change in health systems is always unpredictable, hard won and takes time. The author also warns that many interventions are not successful and those that are, often achieve modest improvements in the vicinity of 16%. Also, searching for things that succeeded (e.g. changing the Ophthalmology referral criteria) promotes a balanced view of the system. [145]

It was also difficult to compare the results of this redesign program to that in the literature. Using DNA rates as an example, the DNA rate for new appointments was higher than for return appointments (both clinics), which is not a consistent finding in other studies. If there are not clear definitions in published articles of the change being measured (e.g. inconsistent definition of a DNA when the patient cancelled on the day of the appointment but after the scheduled appointment time), comparisons between studies will continue to be unconvincing. Comparing the median waiting times with similar outpatient clinics in Australia was also not possible due to varied ways in which waiting times were calculated.

The major benefit of the program for staff were the meetings, which enhanced communication and provided the permission to discuss workplace challenges and inefficiencies. The real-time data, especially the wait list and overdue follow-up appointment figures, provided a demonstration of patient flow previously unseen. The biggest success can be deduced from the changes that continued to be made for at least one year after the support of HSI was withdrawn.

8.2 Factors influencing the implementation and success of redesign initiatives

This section describes the progression of the thematic analysis findings to answer the second research question:

What are the factors influencing the implementation and success of the redesign initiatives?

When constructing the thematic map, the importance of timing and the sequence of the steps in the change process became evident. The thematic map itself was not sufficient to explain the significance of completing each step thoroughly before moving on to the next step. A process map was then developed from the thematic map. Using the sub-themes from Table 7-2, a mind map was first created for each of the major initiatives undertaken by both clinics, as described in Chapters 5 and 6. Each mind map consisted of a chronological list of the steps which occurred during the design and implementation of each initiative, combined with any issues/barriers encountered. All the mind maps were then amalgamated and refined to create a summary of the steps required for a successful redesign project based on the lessons learnt from this study (Figure 8.2). Although this project was based on the Lean principles of patient-centred care and waste minimisation, the cycle is a modified version of the Plan-Do-Study-Act redesign methodology and can be employed in any clinical redesign program. This process map combines this series of incremental steps with facilitators and barriers as described by many authors.[16, 29, 146, 147]

The following section presents each step in detail, including evidence from the literature to reinforce the argument for the suggested chronological order.

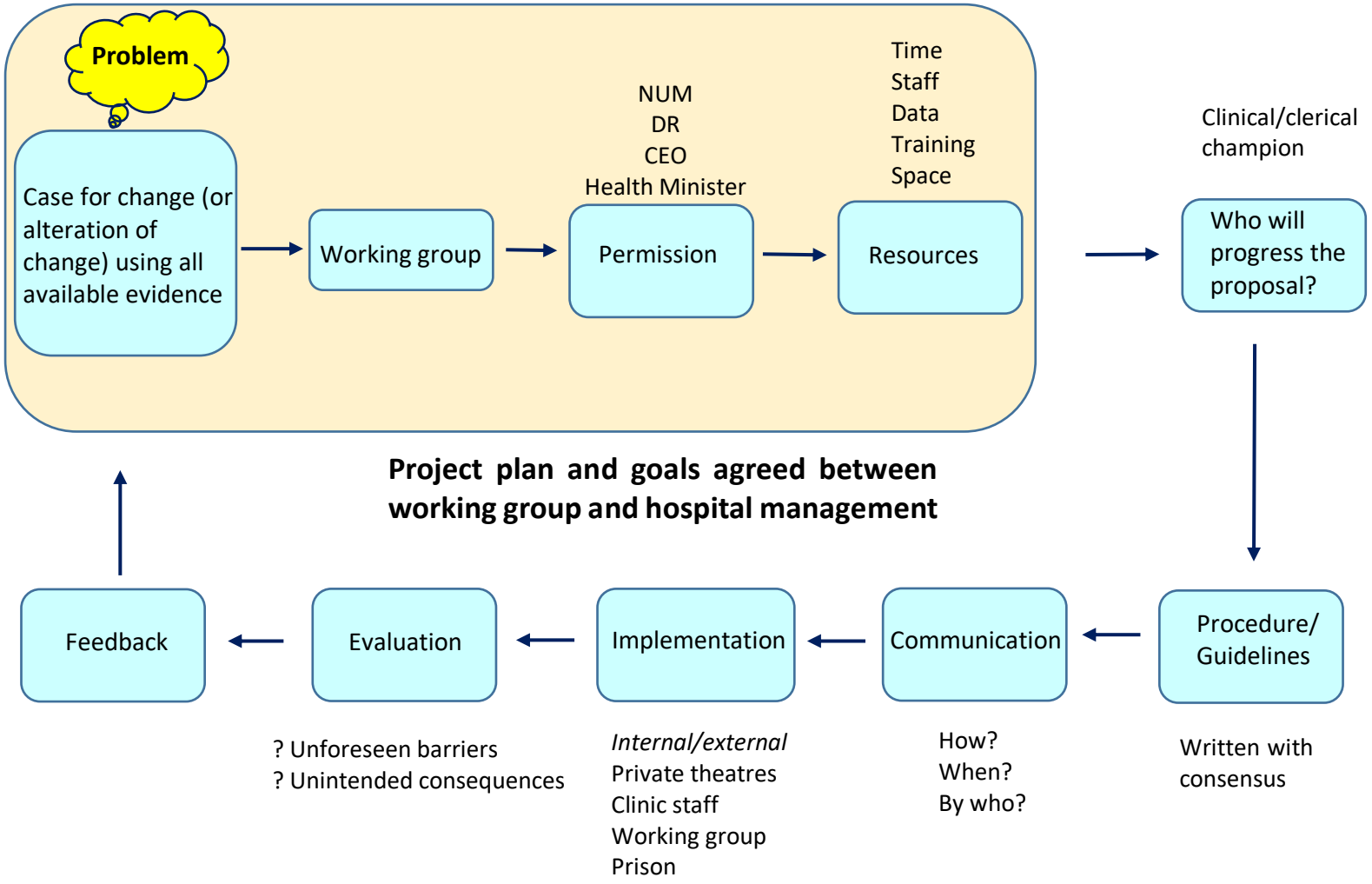


Figure 8. 2 The process map of clinical redesign methodology

8.2.1 Case for change/alteration of change

All initiatives begin with a case for change. Using all the available evidence (hospital data, surveys, literature search) a project plan is agreed between the working group and hospital management. This includes identification of stakeholders, specific targets, timeline and resources. Adaptation of an intervention to the local context[36, 38, 39, 51] is a known facilitator for the successful implementation of Lean projects. In this study all the interventions were proposed and designed by the staff after an introduction to the Lean philosophy of flow and waste. The interventions were also planned according to the Lean ideology that the customer should be benefactor of the change.[18, 29, 148] As Lean practices involve Plan-Do-Study-Act improvement cycles[18, 29], which are continual and iterative, this step is so named to include both the initial proposal of the change and the alteration of the change which occurs after the results of the original intervention are fed back to the working group, hospital management and other stakeholders.

Setting measurable objectives during the planning stage and targeting issues that are important to staff facilitate Lean success.[149] When ambiguous criteria are used to describe the expected benefits of a project, this affects a project's entire life cycle. If a target is hard to measure it is also harder to control and adjust during the project. [150]

The aims of this clinical redesign program were documented on both Working Groups' redesign meeting notes and distributed to all groups before each meeting. The aims were written as "To increase efficiency within existing resources to allow more patients to access clinics" and the goals of the program were written as "Transparency and improvement of wait times". These targets were not detailed and specific enough for the working group to aspire to. The *Specialist clinic improvement guide* (Victoria, Australia), discusses the importance of not only establishing baseline data but also striving for a specific target e.g. to add all referrals to the wait list within three working days of referral acceptance and the discharge summary letter to be sent to the referrer within 5 working days of

discharge from clinic.[151] Goal clarity[16] and clearly defined and tightly focussed objectives have been cited as facilitators for health program redesign success. [149]

Agreeing on and setting realistic timeframes is also important for multiorganisational projects. The report from a quality improvement program in England (*The Productive ward: Releasing time to care*™) discussed the perceived variation in timescales of implementation by stakeholders at different levels of the health system. In 2008, the £50 million project was expected by the government to be rolled out quickly through the NHS, but from surveys of healthcare professionals in 2009 the program was understood to be just in its infancy. The authors noted the variation in progress as an issue to consider when defining objective benchmarks and realistic goals of large-scale healthcare programs".[152]

A priority setting tool is also beneficial for success. [148] Even though the Ophthalmology Working Group did not set priorities and did not finish all the projects, they completed their largest piece of work - to close the diabetic retinopathy screening service. This proposal was viewed with a sense of urgency, as there was concern that if the overall patient numbers in the clinic did not decrease, patients may be at risk of sight loss if follow-up appointments were not allocated in a suitable timeframe.

A documented barrier to change is a decreased sense of urgency.[153] This may be the reason that some initiatives remained incomplete. The 'triage guidelines for doctors' was possibly not completed by the Ophthalmology Working Group as only one doctor was tasked with triaging all the referrals.

The sense of urgency to complete some projects during the study period was perhaps missing as both working groups continued implementing the changes for six months after the official end of the program. Redesign activities were sustained for a further 12 months when the program officer became part of the clinic management team. At one-year post-data collection, clinic management reported back to HSI that because of additional staffing, both the Plastic Surgery and the Ophthalmology clinic had "almost eliminated" the overdue follow-up appointment list.

8.2.2 Working Group characteristics

A team approach to problem solving creates a shared understanding of the problem, potential solutions and nurtures a culture of continual improvement.[43] It has been shown that the group cooperation which occurs during a value stream mapping exercise allows social networks to develop.[24, 149] Including multidisciplinary[43, 44, 154] frontline staff is critical for redesign success, [16, 25, 147] and employing fulltime [16, 25, 149] internally recruited[147, 149] project staff allows the project to progress without the pressure of other duties. Physician involvement has been shown to be an independent success factor for hospital quality improvement activities.[44] This became apparent in this study, as the Plastic Surgery nursing and physiotherapy staff considered the lack of physician engagement responsible for the slow uptake of the new clinic guidelines.

It was beneficial to have a Lean mentor with a background in healthcare, as this assists in staff engagement to provide examples of the real-life application of Lean.[147] A team member from an external department can also offer 'fresh eyes' to issues unrecognised by staff who are present every day.[44] The researcher (previously employed at the RHH) provided this perspective.

Team awareness and understanding of performance data has also been discussed as a facilitator for successful interventions.[44] During the Intervention period, both Working Groups were aware of the real-time continual decrease in number of patients on their respective wait lists. Nevertheless, due to the large number of items on the agenda for the Ophthalmology Working Group meetings, the three-sheet data report was only ever discussed in passing. In hindsight, the report was probably too detailed for the Working Groups to analyse the information in depth during the redesign meetings. Also, as it was the first occasion many of the staff had seen performance data, it may have been too complicated for the staff to interpret. During the final Ophthalmology Working Group meeting, the researcher asked one of the staff their opinion of the decrease in the wait list numbers, and the reply was "I don't understand the graph". This finding is in agreement with Mazocatto *et. al.,* who found

that staff disengaged when information provided to them did not replicate the situation on the floor.[57]

8.2.3 Permission

Permission for Lean interventions is required to obtain information, undertake changes and to make decisions.[51] Depending on the magnitude of the change and who will be affected, the extent of the permission required was different for each initiative. Several initiatives were terminated at this point in the cycle due to a lack of permission e.g. using the ENT waiting room for ophthalmology patients, altering the procedure adult patients were allocated follow-up appointments and the refusal to allow the staff to undertake the Pre-study surveys. Although not all proposals should necessarily be endorsed, Lean thinking empowers and respects staff to identify waste and generate suggestions for change.[25, 32, 67, 155]

8.2.4 Resources

To eliminate contextual and funding differences between programs, most of the resources required for a redesign program are included in this step. Published studies have included additional staff time, [16, 156] redesign training,[30, 44, 149] extra staff (Lean facilitators[16]/ clinical[144]/clerical[44] /data analysts[25] / evaluators[51]) and the remuneration[16] required to cover these additional resources (if not already provided by the hospital). All of the above factors have been described as enablers in successful redesign programs, or as suggested by Brandao de Souza, “barriers often reflect lack of enablers”. [157] In this setting, a lack of clerical staff was cited as the reason for not performing regular wait list audits and a lack of additional clinical staff for the ‘Physio first’ program to proceed despite permission from management.

Having enough time for staff to participate in a redesign program is a complex and challenging problem, especially in Outpatient clinics. The Ophthalmology and Plastic Surgery Working Group initially chose the 7.30 time for the redesign meetings as there was not any suitable time during the day when all the staff could meet. The allied health staff in the Ophthalmology clinic were part-time

and were employed in other locations during the day. Redesign meeting attendance for part-time staff could be a problem because these staff members may need to increase the number of hours they are present at the hospital and this may be not suitable due to other commitments. The Outpatient clinics in the clinical redesign program with a fewer number of weekly sessions and fewer staff (ENT and Neurosurgery) were able to schedule their meetings during a lunch break.

In a study of organisational context on Lean implementation in five hospital systems, researchers found that none of the facilities had an IT infrastructure which fully supported the information needs of the Lean workshops. Some team members gathered data by hand instead of using the electronic health record or administrative data systems present in the hospitals. [149] An increased availability of data is classed as one of the organisational readiness conditions required for the successful launch of a Lean project [158] and Bohmer concluded that successful hospitals have pre-existing well-developed measurement systems and internal data analysis prior to redesign projects.[154]

Two less-frequently acknowledged facilitators (but specific to this project) are the availability of additional clinical space [32, 159] and a low staff turnover and use of external staff members.[160] This was the situation in the Ophthalmology clinic when the usual staff regularly forgot to inform the casual staff about the purpose of the orange “Fast Track Review” card.

Hospital management should be directly involved in decision making, up to and including this step in the cycle. This is to prevent permission being obtained, but then resources being denied and projects stalling at this point.

8.2.5 Progressing the initiative

A clinical (or clerical) champion is required to ensure each initiative will proceed. A subject matter expert from the Working Group usually volunteered for this role. This is the step where many projects were either postponed or delayed due to either overburden, lack of accountability, ambiguous responsibility or a combination of these factors. Items remained on the Ophthalmology redesign agenda for months with no action. After six months in the program, the Working Group only met for

half an hour per month and were not able to discuss all the agenda items during each meeting. At the completion of the data collection period, there still were nine items remaining for a doctor to finalise. This was too many items on the redesign agenda for the part-time Ophthalmologist to complete. Another problem encountered at this step was confusion around whether the proposal was the responsibility of the hospital staff or the redesign program staff e.g. wait list audits in Plastic Surgery clinic. As the program was so entwined with the operational activities of the clinic, the scope of the redesign activities was at times unclear.

In this stage of the cycle, the Working Groups lost ownership of two initiatives. When clinic management rushed both the implementation of the nurse-led Plastic Surgery clinic and the new printer in the Ophthalmology clinic, the steps in the cycle which followed were also rushed, resulting in incomplete staff preparation for the changes. The nurse-led clinic did not have all the policies and procedures written prior to the first patients attending clinic and the printer was situated in an area which disrupted staff flow during the clinic sessions.

8.2.6 New guidelines

Many of the initiatives require guidelines to be written or updated. Although created by consensus, one of the issues facing the Working Groups was where to place the new guidelines once written. It was not standard practice for staff to search the hospital intranet to find a protocol or guideline. When the Plastic Surgery Working Group decided to store the new guidelines as hardcopies and place them outside the clinic consultation rooms, this created problems with the next step in the cycle – communicating the change. This issue was highlighted by the nursing and physiotherapy members of the Working Group debating the optimal method of disseminating guidelines to their junior medical colleagues (the Working Group did not contain a medical representative by this time). Barriers to physician guideline implementation has been divided into three identified causes: physician knowledge and attitude, guideline-related factors and external factors (e.g. lack of resources, organisational constraints, and heavy workload).[161] Rauh *et. al.* proposed that guideline-related

factors are usually the easiest to resolve but are not often considered in practice. These include poor guideline layout, high guideline complexity, or poor clinician access to the guidelines.[161] Poor guideline layout may have been a contributing factor (as hospital templates were not used), but also the issue of guideline access by staff was not adequately addressed during the study.

8.2.7 Communication

After the new procedure has been written by consensus, permission obtained, and resources allocated, details of the implementation are to be communicated to stakeholders in a planned and organised manner. This means considering the most efficient method of communication for each group of stakeholders, including details of how, when and where the change will occur. Additional staff training (if needed) should occur well before the change takes place.

Staff survey results indicated there were communication problems during the implementation of the initiatives that involved the wider clinic staff, a common finding in the literature.[50, 67, 149, 154] Waring *et. al.* discussed barriers to knowledge sharing in the health environment. The authors found where there was regular and inclusive opportunities for interactions, study participants expressed a clearer understanding of co-workers' contribution to the care process, a greater sense of teamwork and co-ordinated working practices.[162] The "Fast Track Review" orange card worked as intended in the Ophthalmology clinic when all the staff were aware of its purpose. Temporary staff ignored the card when they hadn't been instructed on its use (even when it was placed inside a patient's file). Only 50% of the Plastic Surgery clinic staff were aware of the new clinic guidelines and how to access them.

The communication difficulties were confounded by the part-time nature of the work for clinical staff. The doctors and the allied health staff only arrived in the clinics at the start of the clinic session (just prior to the patients arriving) and left immediately after. Nurses were more likely to be in the clinic when patients were not present to complete administration tasks. There were limited opportunities for the multidisciplinary staff to discuss issues during non-clinic time unless they were members of a Working Group.

8.2.8 Implementation

The process of Lean implementation of an initiative is under-investigated in healthcare. More is known about the drivers of success, than the causes of failure.[158] This step explores issues found which affected the implementation of change. At the organisational level, recognition of the need for change is a widely published facilitator for redesign success. [37, 38] Low staff morale and scepticism is a documented barrier[44, 149] and employee understanding and commitment to change is a contributing factor for redesign success.[16, 163, 164] Additional effort in educating new and rotational staff is important in establishing uniform practices and establishing a culture of learning.[43] Staff involvement and engagement is hindered by poor alignment between the problems identified and the changes introduced[57] or by changes which occur too rapidly.[50]

Staff competence and ability to understand the change[148] is a local enabler for Lean success. Harrison found limited quality improvement knowledge, skills and experience as barriers of Lean project success and that teams without management support suggested change proposals that were not feasible.[149]

This study found that administrative process changes initiated by the Working Group (and which involved few clinical staff) were easier to implement and more likely to succeed. These initiatives included the above-mentioned change in the diabetic screening policy and the new referral acceptance and refusal procedures. The complexity of changes was not related to implementation success. This finding is backed by Harrison *et.al.,* who concluded that changing administrative processes is easier than improving the delivery of clinical care.[149] The administrative policies were easier to change because once management permission was obtained, only a small group of staff needed to be informed of the change (which was very specific to the policy). The alteration in the diabetic screening policy took almost one year to implement (requiring multiple wait list audits and letters to all GPs, optometrists, paediatricians, and endocrinologists in southern Tasmania). Once in place, the policy only required the education of administration staff and the referral triage nurse.

Lean has been equated with cost-cutting measures and staff fearing a hidden economic agenda as the purpose for redesign programs.[18, 24] This study did not suffer from these challenges as Lean terminology was not used during this study (the program was referred to as clinical redesign) and it was widely known that the program was well-funded. The Lean philosophy was not implemented as a hospital-wide initiative. The other redesign activities at the RHH used a combination of Lean methodologies, Six-sigma and Theory of constraints. The choice of tools used resided with the redesign mentor assigned to the area.

Lean thinking helped the staff to identify non-value adding time and waste in simple processes during the initial mapping sessions e.g. triaging and documenting referrals in the iPM patient management system. This learning did not always translate into the staff adopting the new practice routinely. Even though the new method of triaging referrals in the Ophthalmology clinic was adopted early in the Intervention period, this new method of working was not adopted as standard practice as problems with the change were commonly mentioned during the redesign meetings. A possible explanation is that this task was performed in the reception area where patient duties always took precedence and it was not the sole responsibility of any nominated staff member.

8.2.9 Evaluation

Studies suggest that Plan-Do-Study-Act cycles are not used to their full potential in healthcare. [28, 31, 165] The issue may be multifactorial, as busy staff may not have time/ability to assess changes once they have been made, but hospitals also may not be able to generate data on the appointed measures.[165] Regular examination of performance data allows comparison with baseline and can be used to hold teams accountable for performance.[25, 67] The lack of performance measures may result in decreased motivation as staff effort is not rewarded with tangible results.[31] Case studies on Lean in health emphasise that evaluations should be relevant to (and not overburden) the staff on the floor and be easy to implement and understand. [30] Reward systems based on real-time accurate data can

be used to help staff adapt to monitoring changes in the new work environment. These include training opportunities, promotions, financial rewards and peer recognition. [166]

Without defined measurements, parties who are involved in projects may perceive success and failure differently.[167] If ambiguous and subjective terminology is used during planning stages of a project, the evaluation will also be based on subjective measurement.[150] In complex environments, such as health, it is important to take evaluations from different stakeholders' perspectives, including those from other areas affected by the changes.[16]

In this study (and as discussed in the literature) staff were not accustomed to systematically testing their redesign endeavours.[31, 57] This became especially evident when an additional four clinics were added to the program, resulting in additional pressure to implement the remaining initiatives without measuring the impact of the existing changes.

Timely evaluations may also uncover unforeseen barriers and unintended consequences of a redesign program. Unforeseen barriers in this research included difficulties in communication due to both the extended physical distance between the clinical and clerical staff in the Ophthalmology clinic, and the part-time presence of medical and allied health staff in the clinic environment. Hospital settings are known to present teamwork communication challenges because healthcare teams are large and diverse, and are seldom in the same place at the same time.[168]

Modern health redesign literature is filled with examples of unintended consequences from reform efforts. Technology-induced errors have risen sharply as a result of an unintended consequence of the very technologies that were intended to reduce classical medical errors [169] e.g. a user's inability to locate patient allergy information in a poorly designed user interface of an electronic health record.[170] In this research, staff were supplied with real-time wait list statistics, which they had not been previously shown. As the program progressed, the Plastic Surgery Working Group may have been rewarded by the decreased number of patients on the wait list whilst over-looking the corresponding increasing number of patients overdue for a follow-up appointment. Another

unintended consequence was using the brightly coloured purple folders (to identify paediatric patients) in the Ophthalmology clinic, but this led to staff avoiding the patients the initiative was trying to bring a focus to.

8.2.10 Feedback

The final step in the process map is the feedback of results to the Working Group, staff and management. This step completes the cycle and enables the initiative to be altered if not successful. Sustainability of change is threatened if the follow-up of projects is limited after completion.[149] Lean is an evolutionary process of continuous improvement.[43] The commitment to change is driven by management allowing staff to experiment and be open to new ways of operating.[25] The overarching goal of Lean is to get all staff focussed on improving the process of patient care, and success is usually achieved by the accumulation of multiple small improvements.[19]

As proposed in project management literature, this study found success factors were interrelated. [167] The external funding provided additional staffing for the project and the hospital management supported existing clinic staff to be employed as project officers. Conversely, the lack of a facilitator in one area of work could influence another area, causing a less than desired outcome e.g. the external resourcing of the project led to the accelerated time frame for the planning of the 2-day workshop, which impeded engagement of both clinic management and the Plastic Surgery physicians. This example shows that barriers and facilitators are so context-dependent that under the same conditions, what was deemed a barrier for redesign success in one clinic had no effect in the other. The engagement of the Ophthalmology physicians was not affected by the rushed start to the project. These two examples demonstrate the complex effect the external funding had on the results. Despite the obvious benefits of a well-funded program, the competing timelines of the different stakeholders (Commonwealth government/HSI/RHH) impacted the study from the beginning.

8.3 Complexity and Lean

Lean thinking did not aid in the reduction of waste when mapping patient flow at the system level. Patient flow was non-linear as patients moved between the unconnected outpatient and surgical wait lists, and between the public and private hospital systems. Tracking Ophthalmology patient movement was particularly challenging due to the additional funding for cataract surgeries and the modification of triage category allocation during the Pre-study period. Considering the wider health system, this study recognised patient flow to be part of an open system. Open systems are characterised by dynamically changing inter-relationships and tensions, and as such the research designs need to be adaptable to changing contexts [171] This research used multiple evaluation measures to evaluate patient flow changes, and another gauge of patient flow (overdue follow-up appointments) was added during the study as additional information about patient movement became available.

Complexity thinking is acknowledging that healthcare is complex, and therefore requires dynamic and adaptable evaluation techniques. Complexity is described as "a dynamic and constantly emerging set of processes and objects that not only interact with each other, but come to be defined by those interactions."[172] Complex systems are open, have blurred boundaries and interact on the basis of internal rules which at times are unpredictable. Complex systems are made up of healthcare professionals who learn from past experiences and tailor interventions to their own cultural and social environments.[173] As in the circumstances of this project, the intervention and its context were inter-related, reciprocally interacting and decisions were made on the basis of incomplete data. [171]

The Medical Research Council (MRC) updated the original framework for the development and testing of complex interventions, first published in 2001, to highlight the importance of process evaluation. This includes capturing what is actually delivered, the context and participant response to, and interactions with the intervention. [174] As observed by Greenhalgh and Papoutsi, the MRC's latest position is a philosophical shift towards a systems perspective that embraces non-linear causality but

their approach is inconsistent,[171] as the MRC still maintains "randomised controlled trials are regarded as the gold standard for establishing the effectiveness of interventions."[174]

The metrics used to evaluate a complex system should be at the system level, not at the level of a single process, whilst ignoring the interacting components.[169] This study used multiple quantitative metrics to describe patient flow, whilst also specifically assessing the individual interventions. Not all the indicators of patient flow were able to be accurately measured. As mentioned in the literature, routinely collected administrative data in health is often of low quality. The data may be compromised in a manner of ways. The data may be:[175]

- flawed, missing or incorrectly recorded;
- uncertain, due to differences in how is rated;
- proximate because the data may be a proxy for key areas of concern; and
- sparse, low volume and limit the possibility for statistical inference.

The term 'FUPS' data was proposed by the authors to describe these flawed, uncertain, proximate and sparse datasets. To use FUPS datasets to evaluate a complex system, the creators suggested three principles of analysis.

- Treat fragmented data as whole but be honest and upfront about its limitations.
- Be transparent in all analyses and use very simple and transparent statistical approaches.
- Triangulate the findings with other information.

Although there is a danger in the over-representation of FUPS data, the authors also argued the risks associated with non-use, which allow interested parties to use the "FUPSness" of the data to "ignore potentially important but uncomfortable findings".[175] This is where multiple measurements of the same initiative are invaluable. For example, due to the flawed appointment dataset the rate of patient and hospital cancellations could not be calculated but using a simple ratio of the number of attended appointments to the number of appointment bookings and cancellations, a measure of waste could be calculated.

8.4 Study strengths

The research was a prospective mixed methods study in which detailed knowledge of the clinic environment was gained through observation and participating in the Working Group activities of two different outpatient clinics redesign activities over a 15-month period. All 52 of both Working Groups' agenda items were tracked to completion or otherwise. The researcher acted as the intermediary between the Working Groups and the data analysts and identified the causes and the extent of the data integrity problems. All the data analysis was performed by the researcher – except for some graphs where the data analysts are acknowledged. The raw data supplied by the RHH was audited and checked for accuracy. Patient movement through the clinic system was investigated thoroughly (in consultation with the staff) to account for external factors which may have influenced the findings.

This study investigated the under-researched area of the dynamic interplay between individuals and the organisation where they work, as organisational change starts with individual behaviour change.[146] A thorough investigation of each clinic's regular routines were explored to verify the results. For example, it was uncovered that the time the last patient departed from clinic each day could not be used as an accurate measure of the clinic finishing time. The administration staff were instructed to depart all the patients from clinic (through the iPM system) before they left for the day, regardless if patients and clinical staff were still present. This meant that if the administration staff left at 5pm, but there were still 4 patients in the clinic, the last 4 patient departure times for that day were also 5pm.

As proposed by Barbour (as considered in Section 3.1.1), the two components in this mixed methods research were complementary, thus ensuring the whole was greater than the sum the parts.[108] Multiple data collection methods were utilised to evaluate the changes in patient flow and also to ensure that the results were due to the program and not external factors. This study also abides by the appraisal criteria for qualitative and quantitative studies (Section 3.1.2, Table 3-2) created by Curry and Nunez-Smith.[11] All four standards of veracity, consistency, applicability and neutrality were

adhered to during the research. A thorough knowledge of patient flow through the outpatient clinic system was gained by observation of the staff work area and patient waiting areas during clinic sessions. The researcher also spent time with the project officer and project support officer discussing each clinic's activities, appointment and wait list practices, and intervention updates. All the raw appointment and wait list data obtained from the RHH was verified by the appointment clerks for authenticity before analysis and the waiting time findings were also independently tested with the results reported by the data analysts.

The research delved beyond the problem of 'simplistic systems' thinking as described by Mannion and Braithwaite 2017, where adverse events have a definable cause which can be 'found and fixed'.[176] This study investigated the local nuances which affected the implementation and success of each initiative, and the environment in which the clinical redesign program took place. It brought together the two concepts of 'work-as-imagined' and 'work-as-done'. Work-as-imagined is the end product of what policy makers and researchers think should happen at the bedside when improvement strategies are planned. Work-as-done is actually what occurs on the front-lines for clinicians to look after patients in complex and challenging environments, which is usually not what the policy makers imagine it to be.[176]

8.5 Limitations

This study was not without limitations.

- It was known prior to the Intervention period that the Ophthalmology clinic was actively recruiting two additional staff members (an appointment clerk and an allied health technician) and both positions were unrelated to the redesign program. Their employment may have contributed to an increased capacity to book additional clinic appointments.

- Each clinic's exact capacity was unknown as only booked appointment data was provided (the unused appointment slots did not appear in the data set). Additionally, when the number of appointments allocated to patients exceeded the capacity of the clinic this also could not be

identified in the supplied dataset. The appointment data set was 'cleansed' as per advice from the data analysts, Working Group and clinic staff. There may have been other internal or external factors regarding data integrity that were not identified. Additional data was requested from the iPM patient management system, but this was unable to be supplied by the hospital due to limited IT staffing levels e.g. time of patients registering and departing clinic.

- The acuity of the Ophthalmology patients almost certainly increased during the study period. Additional medications and treatment for diabetic retinopathy and macular degeneration became available in May 2014. As these medications are required to be given by an Ophthalmologist, this generated a new subspecialty in the Ophthalmology outpatient clinic. Additional external funding for cataract surgeries was granted by the Commonwealth Government and this may have resulted in an alteration of the usual triage practices of referrals during the Pre-study period. The exact dates of these surgeries (and thus clinic appointment dates) could not be confirmed.

- As part of a blitz to decrease the waiting times for elective surgery, additional Plastic Surgery cases took place in April-May 2014, 2015 and 2016. These operations were organised by the Health Department (not by the hospital). The surgeries took place in both the public and private hospitals in Hobart and private hospitals in Victoria. The impact (pre-surgical consultation and post-operative follow-up appointments) on the Plastic Surgery clinic was difficult to quantify. Examining the *ad hoc* (additional) appointments, there was 111 attendances during the Pre-study period and 163 attendances during the Intervention period. Some of the local additional surgeries were performed by the RHH clinic surgeons and these patients may have attended a regular clinic session, or one of the *ad hoc* appointments. As the surgical and wait list data could not be linked, it can only be estimated that these *ad hoc* appointments were the result of these additional surgeries.

- Interrupted time series (ITS) analysis is rated as one of the strongest quasi-experimental research designs in evaluating health care quality improvement programs, especially when the investigator

does not have control over the implementation of the change. This approach involves creating a time series of population-level rates for a particular area of interest and testing statistically for a change in the outcome between the before and after rates. [177] There are limitations and threats to the validity of ITS, and this study did not chose this method of evaluation for the following reasons, as proposed by Penfold and Zhang:[177]

- The redesign program was not the only change which occurred over the time period (externally funded private surgeries may have impacted on the outpatient wait list).
- Missing data is a threat to the validity of the results.
- The composition of the Ophthalmology patient group changed during the study with the inclusion of the intraocular injection patients.
- As the interventions were still being implemented at the end of the data collection period, there was not the required 8 time periods before and after the intervention to evaluate the changes statistically.
- A suitable control group could not be found because the redesign project was implemented in the four largest hospitals in the state.

8.6 Recommendations

As the average length of hospital stays are decreasing world-wide, there is a shift from inpatient care to day care.[178] This necessitates the need for accurate outpatient data (including waiting times) for health service planning to align the delivery of services to meet the changing patterns of need and use of services. Although the findings of the lack of accurate outpatient data is local, national and international literature suggest the problem is wide-spread. The following recommendations are a direct outcome of this research.

1. A standard nationally reported data set. "For the patient, the wait for an appointment with an outpatient clinic matters – it delays diagnosis and treatment... States that do report outpatient clinic wait times do not use consistent measures. All states should publish consistent outpatient waiting time data and improve outcomes."[179] (p. 72). This statement was published by the Grattan Institute, in the *State Orange Book 2018: Policy priorities for states and territories*. The Grattan Institute is an independent Australian public policy "non-partisan think tank providing independent, rigorous and practical solutions to some of the country's most pressing problems." [180](The Grattan Institute).

The entire patient journey should be measured from obtaining an appointment to see the GP to the date of receiving treatment (either therapy as an outpatient or the date of surgery). This is termed the referral-to-treatment time and is monitored in the United Kingdom. This will enable better planning of health services and identify gaps in care. If the complete waiting time data (from GP referral to the day of surgery) was compiled, then individual hospitals' outpatient data integrity would improve due to agreed and specific data definitions, as part of the METeOR National minimum data set specifications.

2. To promote a culture of improvement, hospital clinical redesign programs should be adequately resourced and rewarded. This not only includes allocating time and staff dedicated to traditional redesign activities, consideration should also be given to training in project management and evaluation. The desired goals and outcomes should be incorporated and agreed by all parties during the planning stage.

3. Incorporate an extended planning phase to large-scale government-funded multi-organisational programs. This is to ensure that background issues can be comprehensively researched prior to the start of the intervention phase. This additional preparation time could also ensure that adequate resources are allocated for the evaluation of the program. As shown by this research, contextual factors can be incorporated successfully into the narrative of the results, but sufficient time and resources are required for this to occur.

4. Promote research into healthcare sociotechnical systems (human, social and organisational and technical factors which impact on performance, acceptability and uptake of technology in the workplace).[181] The scope of this redesign program did not include the problems or issues encountered by the administration staff when handling patient appointments. These issues almost certainly contributed to the data integrity problems encountered in this study. Many factors including the physical layout of the clinics (the number of lifts and the administration staff separated from the clinical staff) and the numerous methods in which appointments could be assigned and cancelled proved burdensome at times for the clerical staff. A simplified appointment system with fewer options should result in faster and easier data entry producing a more reliable data set. As technological support is so embedded in clinical practice, it is judicious to include sociotechnical systems research into future health care redesign projects.

8.7 Conclusion

The findings from this thesis demonstrate that health systems research is rich, dynamic, complex, and above all social. It is about documenting the many ways a group of interconnected people navigate

their way through a myriad of problems and solutions. Gaining the viewpoints of the many staff, patients and managers affected provides valuable insights into the way they are influenced and react to change.

Outpatient clinics are part of an open extended healthcare system, which must be considered when evaluating redesign programs. Several measures of patient flow should be used to describe outcomes of projects in the dynamic healthcare environment. Even though the changes were sometimes difficult to quantify in numerical terms, the factors influencing the implementation and success of the redesign initiatives could be described by three overarching themes: Context, People and Process. The thematic analysis did not adequately describe the importance of project management principles, so an extended 10-step version of the Plan-Do-Study-Act improvement cycle was created. By using this process map as a framework for a health improvement proposal, policy makers, managers and staff should be able to agree on common goals and outcomes from the outset.

References

1. Duckett S. Getting an initial specialists' appointment is the hidden waitlist. The Conversation (Australia; Health + Medicine) [Internet]. 2018 [cited 2018 Aug 15]. Available from: https://theconversation.com/getting-an-initial-specialists-appointment-is-the-hidden-waitlist-99507.

2. Viberg N, Forsberg BC, Borowitz M, Molin R. International comparisons of waiting times in health care - limitations and prospects. Health policy. 2013;112(1-2):53-61.

3. Australian Bureau of Statistics. Regional population growth, 2015-16 [Internet]. ABS cat.no. 3218.0; 2017 [cited 2018 May 25]. Available from: http://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/3218.02015-16?OpenDocument.

4. Ahmed S, Shaw K, Tye I, Edwards L, Kneebone J. Primary Health Tasmania Needs Assessment: Health Intellegence Report [Internet]. Hobart, Tasmania: Primary Health Tasmania; 2017 [cited 2018 May 31]. Available from: https://www.primaryhealthtas.com.au/sites/default/files/2017-health-intelligence-report.pdf.

5. Australian Bureau of Statistics. National Health Survey: First Results, 2014-15 [Internet]. ABS 4364.55.001; 2016 [cited 2018 Jul 31]. Available from: http://www.abs.gov.au/ausstats/abs@.nsf/Lookup/by%20Subject/4364.0.55.001~2014-15~Main%20Features~Key%20Findings%20%E2%80%94%20States%20and%20Territories~10001.

6. Australian Bureau of Statistics. Data by Region [Internet]. ABS; 2018 [cited 2018 Aug 28]. Available from: http://stat.abs.gov.au/itt/r.jsp?databyregion

7. Tasmanian Health Service. Outpatient Clinics [Internet]. Tasmanian Government; 2017 [cited 2017 May 04]. Available from: http://outpatients.tas.gov.au/home.

8. Council of Australian Governments. National partnership agreement in improving health services in Tasmania [Internet]. Commonwealth of Australia; 2012 [cited 2017 May 11]. Available from: http://www.federalfinancialrelations.gov.au/content/npa/health/_archive/improving_health_services/national_partnership_2014.pdf.

9. Health Services Innovation Tasmania. Tasmanian Health Partners Consortium Terms of Reference. Unpublished confidential document;. 2015.

10. Council on Federal Financial Relations. Reforming elective surgery in Tasmania [Internet]. Commonwealth of Australia; 2015 [cited 2017 May 11]. Available from: www.federalfinancialrelations.gov.au/content/npa/.../Tas_schedule_a_2015.rtf.

11. Curry L, Nunez-Smith M. Mixed Methods in Health Sciences Research - A Practical Primer. California, USA: Sage; 2015.

12. Institute of Medicine. To Err is Human: Building a Safer Health System. Kohn LT, Corrigan JM, Donaldson MS, editors. Washington, DC: National Academies Press 2000.

13. Australian Institute of Health and Welfare. 25 years of health expenditure in Australia 1989 to 2013-2014 [Internet]. AIHW Cat.no. HWE 66; 2016 [cited 2017 May 24]. Available from: https://www.aihw.gov.au/search?%7B%22SearchText%22:%2225%20years%22%7D.

14. Locock L. Healthcare redesign: meaning, origins and applications. Quality Saf Health Care. 2003;12:53-8.

15. Grimshaw JM, Shirran L, Thomas R, Mowatt G, Fraser C, Bero L, et al. Changing provider behavior: an overview of systematic reviews of interventions. Med Care. 2001;39(8 Suppl 2):Ii2-45.

16. Stelson P, Hille J, Eseonu C, Doolen T. What drives continuous improvement project success in healthcare? Intl J Health Care Qual Assur. 2017;30(1):43-57.

17. Walshe K. Pseudoinnovation: the development and spread of healthcare quality improvement methodologies. Int J Qual Health Care. 2009;21.

18. Savage C, Parke L, von Knorring M, Mazzocato P. Does lean muddy the quality improvement waters? A qualitative study of how a hospital management team understands lean in the context of quality improvement. BMC Health Serv Res. 2016;16(1):588.

19. Protzman C, Kerpchar J, Mayzell G. Leveraging Lean in Outpatient Clinics, creating a cost effective, standardized, high quality, patient-focussed operation. Florida, USA: CRC Press; 2015.

20. Toyota Motor Corporation. The origin of the Toyota Production System, [Internet]. 2018 [cited 2018 Apr 18]. Available from: http://www.toyota-global.com/company/vision_philosophy/toyota_production_system/origin_of_the_toyota_production_system.html.

21. Womack JP, Jones DT. Lean Thinking banish waste and create wealth in your corporation. 2 ed. London: Simon & Schuster; 2003.

22. Ben-Tovim DI, Bassham JE, Bennett DM, Dougherty ML, Martin MA, O'Neill SJ, et al. Redesigning care at the Flinders Medical Centre: clinical process redesign using "lean thinking". Med J Aus 2008;188(6 Suppl):S27-31.

23. Southern Adelaide Health Service. Redesigning care: right care right time: SA Health; 2007 [cited 2017 May 10]. Available from: http://www.flinders.sa.gov.au/redesigningcare/files/pages/fact_sheet_value_stream_in.pdf.

24. Radnor ZJ, Holweg M, Waring J. Lean in healthcare: The unfilled promise? Soc Sci Med. 2012;74.

25. Hung D, Martinez M, Yakir M, Gray C. Implementing a Lean Management System in Primary Care: Facilitators and Barriers From the Front Lines. Qual Manag Health Care. 2015;24(3):103-8.

26. Imai M. KAIZEN (Ky'zen) The key to Japan's competitive success. New York, USA: McGraw-Hill; 1986

27. Suárez-Barraza MF, Miguel-Dávila JÁ. Assessing the design, management and improvement of Kaizen projects in local governments. Bus. Process Manag. J. 2014;20(3):392-411.

28. Taylor MJ, Mcnicholas C, Nicolay C, Darzi A, Bell D, Reed JE. Systematic review of the application of the plan-do-study-act method to improve quality in healthcare. BMJ Qual Saf. 2014;23.

29. Hwang P, Hwang D, Hong P. Lean practices for quality results: a case illustration. Int J Health Care Qual Assur. 2014;27(8):729-41.

30. Al-Balushi S, Sohal AS, Singh PJ, Al Hajri A, Al Farsi YM, Al Abri R. Readiness factors for lean implementation in healthcare settings--a literature review. J Health Organ Manag. 2014;28(2):135-53.

31. Mazzocato P, Stenfors-Hayes T, von Thiele Schwarz U, Hasson H, Nystrom ME. Kaizen practice in healthcare: a qualitative analysis of hospital employees' suggestions for improvement. BMJ Open. 2016;6(7):e012256.

32. Dickson EW, Anguelov Z, Vetterick D, Eller A, Singh S. Use of lean in the emergency department: a case series of 4 hospitals. Ann Emerg Med. 2009;54(4):504-10.

33. Farris JA, Van Aken EM, Doolen TL, Worley J. Learning From Less Successful Kaizen Events: A Case Study. Eng Manag J. 2008;20(3):10-20.

34. Spear S, Bowen HK. Decoding the DNA of the Toyota Production System. Harvard Business Review. 1999;77(5):96-106.

35. Bowling A, Rowe G, Lambert N, Waddington M, Mahtani KR, Kenten C, et al. The measurement of patients' expectations for health care: A review and psychometric testing of a measure of patients' expectations. Health Technol Asses. 2012;16(30):1-532.

36. Andersen H, Rovik KA, Ingebrigtsen T. Lean thinking in hospitals: is there a cure for the absence of evidence? A systematic review of reviews. BMJ Open. 2014;4(1):e003873.

37. Andersen H. How to design Lean interventions to enable impact, sustainability and effectiveness. A mixed-method study. J Hosp Adm. 2015;4(5):18-25.

38. Deblois S, Lepanto L. Lean and Six Sigma in acute care: a systematic review of reviews. Int J Health Care Qual Assur. 2016;29(2):192-208.

39. Walshe K. Understanding what works-and why-in quality improvement: the need for theory-driven evaluation. Int J Qual Health Care. 2007;19(2):57-9.

40. Walshe K, Freeman T. Effectiveness of quality improvement: learning from evaluations. Qual Saf Health Care. 2002;11(1):85-7.

41. Moraros J, Lemstra M, Nwankwo C. Lean interventions in healthcare: do they actually work? A systematic literature review. Int J Qual Health Care. 2016;28(2):150-65.

42. Ovretveit J, Bate P, Cleary P, Cretin S, Gustafson D, Mcinnes K. Quality collaboratives: lessons from research. Qual Saf Health Care. 2002;11.

43. Mazzocato P, Savage C, Brommels M, Aronsson H, Thor J. Lean thinking in healthcare: a realist review of the literature. Qual Saf Health Care. 2010;19.

44. Kringos DS, Sunol R, Wagner C, Mannion R, Michel P, Klazinga NS, et al. The influence of context on the effectiveness of hospital quality improvement strategies: a review of systematic reviews. BMC Health Serv Res. 2015;15:277.

45. Kaplan HC, Brady PW, Dritz MC, Hooper DK, Linam WM, Froehle CM. The influence of context on quality improvement success in health care: a systematic review of the literature. The Milbank Quarterly. 2010;88.

46. Gabutti I, Mascia D, Cicchetti A. Exploring "patient-centered" hospitals: a systematic review to understand change. BMC Health Services Research. 2017;17(1):364.

47. Mazur LM, McCreery JK, Chen S-J. Quality improvement in hospitals: Identifying and understanding behaviors. Journal Healthcare Engineering. 2012;3(4).

48. Tucker AL, Edmondson AC. Why hospitals don't learn from failures: Organizational and psychological dynamics that inhibit system change. Calif Manage Rev. 2003;45(2):55-72.

49. McIntosh T. Rolling-out lean in the Saskatchewan health care system: politics derailing policy. Health Reform Observer - Observatoire des Reformes de Sante. 2016;4(1: Article 3).

50. Mazzocato P, Holden RJ, Brommels M, Aronsson H, Backman U, Elg M, et al. How does lean work in emergency care? A case study of a lean-inspired intervention at the Astrid Lindgren Children's hospital, Stockholm, Sweden. BMC Health Serv Res. 2012;12:28.

51. Holden RJ. Lean thinking in emergency departments: A critical review. Ann Emerg Med. 2011;57(3):265-78.

52. Costa LBM, Godinho Filho M. Lean healthcare: review, classification and analysis of literature. Production Planning & Control. 2016;27(10):823-36.

53. Radnor Z, Osborne SP. Lean: A failed theory for public services? Public Management Review. 2013;15(2):265-87.

54. Osborne SP, Kinder T. Debate: 'Want doesn't get'? Public management responses to the recession. Public Money & Management. 2011;31(2):85-8.

55. Naiker U, FitzGerald G, Dulhunty JM, Rosemann M. Time to wait: a systematic review of strategies that affect out-patient waiting times. Aust Health Rev 2018 Jun;42(3);286-293

56. Harding KE, Robertson N, Snowdon DA, Watts JJ, Karimi L, O'Reilly M, et al. Are wait lists inevitable in subacute ambulatory and community health services? A qualitative analysis. Aust Health Rev. 2018 Feb;42(1):93-9.

57. Mazzocato P, Thor J, Bäckman U, Brommels M, Carlsson J, Jonsson F. Complexity complicates lean: lessons from seven emergency services. J Health Organ Manag. 2014;28.

58. Raab SS, Andrew-Jaja C, Grzybicki DM, Vrbin CM, Chesin CM, Fisch JM, et al. Dissemination of Lean methods to improve Pap testing quality and patient safety. J Low Genit Tract Dis. 2008;12(2):103-10.

59. Hitti EA, El-Eid GR, Tamim H, Saleh R, Saliba M, Naffaa L. Improving Emergency Department radiology transportation time: a successful implementation of lean methodology. BMC Health Services Research. 2017;17(1):625.

60. Lamm MH, Eckel S, Daniels R, Amerine LB. Using lean principles to improve outpatient adult infusion clinic chemotherapy preparation turnaround times. Am J Health Syst Pharm. 2015;72(13):1138-46.

61. Cerfolio RJ. Lean, Efficient, and Profitable Operating Rooms: How I Teach It. Ann Thorac Surg. 2018;105(4):991-3.

62. Ciulla TA, Tatikonda MV, ElMaraghi YA, Hussain RM, Hill AL, Clary JM, et al. Lean six sigma techniques to improve ophthalmology clinic efficiency Retina 2018 Sep;38(9);1688-1698

63. Monroe-Wise A, Reisner E, Sherr K, Ojakaa D, Mbau L, Kisia P, et al. Using lean manufacturing principles to evaluate wait times for HIV-positive patients in an urban clinic in Kenya. Int J STD AIDS. 2017;28(14):1410-8.

64. Edwards L, Hermis K, LeGette CR, Lujan LA, Scarlett C. Acuity-based scheduling: Outcomes in ambulatory oncology centers. Clin J Oncol Nurs. 2017;21(2):250-3.

65. Lin SY, Gavney D, Ishman SL, Cady-Reh J. Use of lean sigma principles in a tertiary care otolaryngology clinic to improve efficiency. Laryngoscope. 2013;123(11):2643-8.

66. Callaway NF, Park JH, Maya-Silva J, Leng T. Thinking Lean: Improving vitreoretinal clinic efficiency by decentralizing optical coherence tomography. Retina. 2016;36(2):335-41.

67. Wong AM, During D, Hartman M, Lappan-Gracon S, Hicks M, Bajwa S. Lean transformation of the eye clinic at The Hospital for Sick Children: Challenging an implicit mental model and lessons learned. Healthcare Q 2016;19(1):36-41.

68. Willis S, Pardos-Martinez M, Coker B, Thomas K, Anderson P, Rottenberg G, et al. The successful, sustainable elimination of a waiting list for urology outpatients BJU Int. 2011;107(4):526-30.

69. NHS England. NHS waiting times: Appointment booking [Internet]. NHS England; 2016 [cited 2018 Apr 10]. Available from: https://www.nhs.uk/NHSEngland/appointment-booking/Pages/nhs-waiting-times.aspx.

70. Chand S, Moskowitz H, Norris JB, Shade S, Willis DR. Improving patient flow at an outpatient clinic: study of sources of variability and improvement factors. Health Care Manag Sci. 2009;12(3):325-40.

71. Merriam-Webster. Medical Dictionary [Internet]. Springfield, Massachusetts: Merriam Webster Incorporated; 2015 [cited 2018 Aug 20]. Available from: <http://www.merriam-webster.com/medical/secondary%20care.

72. Australian Institute of Health and Welfare. Non-admitted patient care 2015-16: Australian hospital statistics. [Internet]. Canberra, ACT: AIHW. Health services series no. 76. Cat. no. HSE 188; 2017 [cited 2017 Jul 5]. Available from: https://www.aihw.gov.au/getmedia/82a9e53b-82e2-4939-8c0e-a1da229b40d2/21058.pdf.aspx?inline=true.

73. Australian Institute of Health and Welfare. Non-admitted patient care 2014-15: Australian Hospital Statistics [Internet]. Canberra, ACT: AIHW. Health services series no. 69. Cat. no. HSE 174. ; 2016 [cited 2017 May 4]. Available from: https://www.aihw.gov.au/reports/hospitals/non-admitted-patient-care-2014-15-australian-hospital-statistics/contents/table-of-contents.

74. Department of Human Services. Referring and requesting services under Medicare [Internet]. Australian Government; 2016 [cited 2017 May 04]. Available from: https://www.humanservices.gov.au/health-professionals/subjects/referrals-under-medicare.

75. Australian Institute of Health and Welfare. Capability statement [Internet]. AIHW; 2017 [cited 2017 Feb 21]. Available from: http://www.aihw.gov.au/capability-statement/.

76. Australian Institute of Health and Welfare. Non-admitted patient care 2016-17: Australian hospital statistics [Internet]. Canberra, ACT: AIHW. Health services series no.87. Cat. no. HSE 206; 2018 [cited 2018 Jul 24]. Available from: https://www.aihw.gov.au/getmedia/a6c9c592-4e8b-4b53-b7f6-3a01d91ed801/aihw-hse-206.pdf.aspx?inline=true.

77. Australian Institute of Health and Welfare. Non-admitted patient care 2013-14: Australian hospital statistics. [Internet]. Canberra, ACT: AIHW. Health services series no.62. Cat. no. HSE 159.; 2015 [cited 2017 Feb 02]. Available from: http://www.aihw.gov.au/publication-detail/?id=60129551441.

78. Organisation for Economic Co-operation and Development. About the OECD [Internet]. Paris, France: OECD; 2016 [cited 2017 Feb 02]. Available from: http://www.oecd.org/about/.

79. Organisation for Economic Co-operation and Development. OECD.Stat. Health care utilisation: waiting times [Internet]. Paris: OECD Publishing; 2016 [updated 21/02/2017; cited 2017 Feb 02]. Available from: http://stats.oecd.org/index.aspx?DataSetCode=HEALTH_STAT.

80. Organisation for economic co-operation and developement. OECD Stat. Health care quality indicators: Patient experiences [Internet]. OECD Publishing; 2017 [cited 2017 Jul 10]. Available from: http://stats.oecd.org/index.aspx?DataSetCode=HEALTH_STAT.

81. Martinez de Pancorbo C, Moral L. Improving waiting list information systems. Waiting lists and waiting times in health care managing demand and supply [Internet]. Leuven, Belguim: HOPE: Standing committee of the hospitals of the E.U.; 2001 [cited 2017 Feb 21]. Available from: http://www.hope.be/wp-content/uploads/2015/11/60_2001_HOPE-REPORT_Waiting-lists-and-waiting-times-in-health-care-managing-demand-and-supply.pdf.

82. NHS National Services Scotland. 18 Weeks RTT [Internet]. ISD Scotland; [cited 2018 April 10]. Available from: http://www.isdscotland.org/Health-Topics/Waiting-Times/18-Weeks-RTT/.

83. Welsh Government. Health statistics Wales, [Internet]. Welsh Government; 2017 [cited 2018 April 10]. Available from: http://gov.wales/statistics-and-research/health-statistics-wales/?lang=en.

84. Department of Health. Northern Ireland waiting times statistics: Outpatient waiting times quarter ending September 2016 [Internet]. Belfast: NHS Northern Ireland; 2016 [cited 2018 April 14]. Available from: https://www.health-ni.gov.uk/sites/default/files/publications/health/hs-niwts-outpatient-waiting-times-q2-16-17.pdf.

85. Stoop AP, Vrangbæk K, Berg M. Theory and practice of waiting time data as a performance indicator in health care: A case study from The Netherlands. Health Policy. 2005;73(1):41-51.

86. Siciliani L, Borowitz M, Moran V, editors. Waiting time policies in the health sector: What works?: OECD Health Policy Studies, OECD Publishing; 2013.

87. Standing Committee of the Hospitals of the European Union. Measuring and comparing waiting lists A study of four European countries [Internet] Brussels 2004 [Available from: http://www.hope.be/wp-content/uploads/2015/11/72_2004_OTHER_Measuring-and-comparing-waiting-lists-a-study-in-four-European-countries.pdf.

88. Hanning M. Measuring and comparing waiting lists: A study in four European countries. Third report of HOPES's working party on management of waiting lists [Internet]. 2004 [cited 2017 Jul 06]. Available from: http://www.hope.be/wp-content/uploads/2015/11/72_2004_OTHER_Measuring-and-comparing-waiting-lists-a-study-in-four-European-countries.pdf.

89. Health Improvement Unit. Specialist outpatient services. Standard QH-IMP-300-1:2016 [Internet]. Department of Health, Queensland; 2016 [cited 2017 Jun 06]. Available from: https://www.health.qld.gov.au/__data/assets/pdf_file/0029/164756/qh-imp-300-1.pdf.

90. Boyce T. Real patients coming to real harm: Ophthalmology services in Wales [Internet]. Royal National Institute of the Blind; 2014 [cited 2017 Jul 06]. Available from: http://www.rnib.org.uk/sites/default/files/Real_patients_coming_to_real_harm_.pdf.

91. Department of Health and Human Services. Access to specialist clinics in Victoria:[Internet] State Government of Victoria, 2017 [cited 2017 Jul 06]. Available from: https://www2.health.vic.gov.au/hospitals-and-health-services/patient-care/specialist-clinics/specialist-clinics-program/access-policy.

92. Alford S, Craighead P, Williams D. Expert panel on waiting list management: Report to the Minister for Health [Internet] 2012 [cited 2017 Jul 06]. Available from: http://edstatus.health.vic.gov.au/Renderers/ShowMedia.ashx?id=c4f4c4e1-7cdb-4f02-864a-38e149b73e2b.

93. Barua B. Waiting your turn: Wait times for health care in Canada [Internet} 2017 [cited 2018 Apr 11]. Available from: https://www.fraserinstitute.org/sites/default/files/waiting-your-turn-2017.pdf.

94. Tasmanian Health Service. Estimated outpatient appointment waiting times - Southern region [Internet]. Hobart, Tasmania: Tasmanian Government; 2015 [cited 2018 Apr 10]. Available from: http://outpatients.tas.gov.au/clinicians/wait_times/wait_times.

95. Australian Institute of Health and Welfare. MyHospitals: About the data [Internet]. AIHW; 2018 [cited 2018 Apr 10]. Available from: https://www.myhospitals.gov.au/about-the-data/data-overview.

96. Australian Institute of Health and Welfare. Australia's health 2014 Canberra: AIHW, cat. no. AUS 178; 2014 [cited 2017 Jul 10]. Available from: http://www.aihw.gov.au/australias-health/2014/.

97.Australian Bureau of Statistics. Patient experiences in Australia: States and territories, 2013-14, Tasmania [Internet]. Canberra: ABS 4839.0.55.002; 2015 [cited 2017 Jul 01]. Available from: http://www.abs.gov.au/ausstats/abs@.nsf/Latestproducts/4839.0.55.002Main%20Features72013-14?opendocument&tabname=Summary&prodno=4839.0.55.002&issue=2013-14&num=&view=.

98. Australian Bureau of Statistics. Patient experiences in Australia: Summary of findings, 2015-16 [Internet]. Canberra: ABS.4839.0 2016 [cited 2017 Jul 10]. Available from: http://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/4839.02015-16?OpenDocument.

99. Australian Bureau of Statistics. National Health Survey: Health Service Usage and Health Related Actions, Australia, 2014-15 [Internet]. ABS 4364.0.55.002; 2017 [cited 2017 Jul 10]. Available from: http://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/4364.0.55.0022014-15?OpenDocument.

100. Queensland Health. Hospital performance: specialist outpatient: Gold Coast University Hospital [Internet]. Queensland Government; 2018 [cited 2018 Apr 13]. Available from: http://www.performance.health.qld.gov.au/hospitalperformance/op-main.aspx?hospital=936.

101. Department of Health and Human Services. Victoria Health service performance. Statewise performance data: specialist clinics [Internet]. State Government of Victoria; 2018 [cited 2018 Feb 02]. Available from: http://performance.health.vic.gov.au/Home/Category.aspx?CategoryKey=138&CatKey=152#Anchor.

102. Queensland Health. Specialist outpatient: Outpatient indicators [Internet]. Queensland Government; 2016 [cited 2017 Sep 14]. Available from: http://www.performance.health.qld.gov.au/hospitalperformance/op-indicators.aspx?hospital=99999#statement.

103. Wales Audit Office. Review of follow-up outpatient appointments: Cwm Taf University Health Board. Document reference: 538A2015 [Internet]. 2014-2015 [cited 2018 Feb 3]. Available from: https://www.audit.wales/system/files/publications/CTUHB_review_of_follow_up_outpatients_appointments.pdf.

104. Burke Johnson R, Onwuegbuzie AJ. Mixed methods research: A research paradigm whose time has come. Educational Researcher. 2004;33(7):14-26.

105. Creamer EG. An introduction to fully intergrated mixed methods research. California, USA: Sage; 2018.

106. Creswell JW, Plano Clark VL. Designing and conducting mixed methods research. Second ed. California, USA: Sage; 2011.

107. Douven I. Abduction. In: Zalta EN, editor. The Stanford Encyclopaedia of Philosophy (Summer 2017 Edition).

108. Barbour RS. The case for combining qualitative and quantitative approaches in health services research. J Health Serv Res Policy. 1999;4(1):39-43.

109. Stame N. Theory-based evaluation and types of complexity. Evaluation. 2004;10(1):58-76.

110. Creswell JW, Plano Clark VL. Designing and conducting mixed methods research. Third ed. Los Angeles, USA: Sage; 2018.

111. Creswell JW. Research Design. California, USA: Sage; 2014.

112. Pommier J, Guével M-R, Jourdan D. Evaluation of health promotion in schools: a realistic evaluation approach using mixed methods. BMC Public Health. 2010;10.

113. Murtagh MJ, Thomson RG, May CR, Rapley T, Heaven BR, Graham RH, et al. Qualitative methods in a randomised controlled trial: the role of an integrated qualitative process evaluation in providing

evidence to discontinue the intervention in one arm of a trial of a decision support tool. Qual Saf Health Care. 2007;16(3):224-9.

114. Hilton BA, Budgen C, Molzahn AE, Attridge CB. Developing and testing instruments to measure client outcomes at the Comox Valley Nursing Center. Public Health Nurs. 2001;18(5):327-39.

115. Fetters MD, Curry LA, Creswell JW. Achieving Integration in Mixed Methods Designs—Principles and Practices. Health Services Research. 2013;48(6 Pt 2):2134-56.

116. Yin RK. Mixed methods research: Are the methods genuinely intergrated or merely parallel? Research in the Schools. 2006;13(1):41-7.

117. Coxon APM. Integrating Qualitative and Quantitative Data: What does the User Need? Forum Qualitative Sozialforschung / Forum: Qualitative Social Research. 2005;6(2):Art. 40.

118. Andrew S, Halcomb EJ. Mixed Methods Research for Nursing and the Health Sciences. Hoboken, United Kingdom: John Wiley & Sons, Incorporated; 2009.

119. Picker Institue Europe. NHS Outpatient Department Local Survey: Question bank tool [Internet]. Oxford, United Kingdom: Picker Institute Europe; 2011 [cited 2015 Jan 3]. Available from: http://www.nhssurveys.org/Filestore//documents/Outpatient_allquestions.pdf.

120. NHS England. Patient Reported Outcome Measures (PROMS) [Internet]. Oxford, United Kingdom: NHS England; 2011 [cited 2015 Jan 3]. Available from: https://www.england.nhs.uk/statistics/statistical-work-areas/proms/.

121. NHS England. NHS staff survey [Internet]. Oxford, United Kingdon: NHS; 2014 [cited 2015 Jan 3]. Available from: https://www.england.nhs.uk/statistics/statistical-work-areas/nhs-staff-survey-in-england/.

122. Singman EL, Haberman CV, Appelbaum J, Tian J, Shafer K, Toerper M, et al. Electronic tracking of patients in an outpatient ophthalmology clinic to improve efficient flow: A feasibility analysis and benchmarking study. Q Manag Health Care. 2015;24(4):190-9

123. Braun V, Clarke V. Using thematic analysis in psychology. Qualitative Research in Psychology. 2006;3(2):77-101.

124. Alhojailan MI. Thematic analysis: A critical review of its process and evaluation W East J Soc Sci. 2012;1(1):39-47.

125. Braun V, Clarke V. Thematic analysis. In: Cooper H, Camic PM, Long DL, Panter AT, Rindskopf D, Sher KJ, et al., editors. APA handbook of research methods in psychology, Vol 2: Research designs: Quantitative, qualitative, neuropsychological, and biological. Washington, DC, US: American Psychological Association; 2012. p. 57-71.

126. Meade O, Buchanan H, Coulson N. The use of an online support group for neuromuscular disorders: a thematic analysis of message postings. Disability & Rehabilitation. 2018;40(19):2300-10.

127. Ohl M, Dillon D, Moeckli J, Ono S, Waterbury N, Sissel J, et al. Mixed-methods evaluation of a telehealth collaborative care program for persons with HIV infection in a rural setting. J Gen Intern Med. 2013;28(9):1165-73.

128. The Health Foundation. Improving patient flow London [Internet] The Health Foundation; 2013 [cited 2018 May 28]. Available from: https://www.health.org.uk/sites/default/files/ImprovingPatientFlow_fullversion.pdf.

129. Australian Institute of Health and Welfare. Australian Hospital Statistics 2012-13 [Internet]. Canberra: AIHW Cat.no: HSE 145; 2014 [cited 2017 Nov 24]. Available from: https://www.aihw.gov.au/reports/hospitals/australian-hospital-statistics-2012-13.

130. Shrestha MP, Hu C, Taleban S. Appointment wait time, primary care provider status, and patient demographics are associated with nonattendance at outpatient gastroenterology clinic. J Clin Gastroenterol. 2017;51(5);433-438.

131. Giunta D, Briatore A, Baum A, Luna D, Waisman G, de Quiros FG. Factors associated with nonattendance at clinical medicine scheduled outpatient appointments in a university general hospital. Patient Prefer Adherence. 2013;7:1163-70.

132. Australian Commission on Safety and Quality in Health Care. The second Australian atlas of healthcare variation Sydney: ACSQHC; 2017.

133. Eye Health Working Group. Third Progress Report to Australian Health Ministers (2011-2014) - National Framework for Action to Promote Eye Health and Prevent Avoidable Blindness and Vision Loss [Internet]. Commonwealth of Australia; 2015 [cited 2018 Jun 14]. Available from: http://www.health.gov.au/internet/main/publishing.nsf/Content/8F3A179870AE7DC2CA258035007E09C1/$File/3rd%20Progress%20report%20under%20National%20Framework%20for%20Eye%20Health.pdf.

134. Dantas LF, Fleck JL, Cyrino Oliveira FL, Hamacher S. No-shows in appointment scheduling – a systematic literature review. Health Policy. 2018;122(4):412-21.

135. Aprahamian AD, Coats DK, Paysse EA, Brady-Mccreery K. Compliance with outpatient follow-up recommendations for infants at risk for retinopathy of prematurity. J AAPOS. 2000;4(5):282-6.

136. Koppens JM, Dai S, Mora J. Factors related to non-attendance in a public eye clinic. Clin Exp Ophthalmol. 2005;33(5):553-4.

137. Williams GS, Blyth C, Laws D. A multivariate analysis of factors affecting did not attend (DNA) rates in a paediatric eye clinic: do weather and school holidays affect attendance at paediatric eye clinic? Ulster Med J. 2015;84(2):132.

138. Lin H, Chen W, Luo L, Congdon N, Zhang X, Zhong X, et al. Effectiveness of a short message reminder in increasing compliance with pediatric cataract treatment: a randomized trial. Ophthalmology. 2012;119(12):2463-70.

139. Potamitis T, Chell PB, Jones HS, Murray PI. Non-attendance at ophthalmology outpatient clinics. J R Soc Med. 1994;87(10):591-3.

140. King A, David D, Jones HS, O'Brien C. Factors affecting non-attendance in an ophthalmic outpatient department. J R Soc Med. 1995;88(2):88-90.

141. French LR, Turner KM, Morley H, Goldsworthy L, Sharp DJ, Hamilton-Shield J. Characteristics of children who do not attend their hospital appointments, and GPs' response: a mixed methods study in primary and secondary care. British J Gen Pract. 2017;67(660):e483-e9.

142. Stone CA, Palmer JH, Saxby PJ, Devaraj VS. Reducing non-attendance at outpatient clinics. J R Soc Med. 1999;92(3):114-8.

143. Ding X, Gellad ZF, Mather C, 3rd, Barth P, Poon EG, Newman M, et al. Designing risk prediction models for ambulatory no-shows across different specialties and clinics. J Am Med Inform Assoc. 2018;25(8).

144. Schoch PA, Adair L. Successfully reforming orthopaedic outpatients. Aust Health Rev 2012;36(2):233-7.

145. Braithwaite J. Changing how we think about healthcare improvement. BMJ. 2018;361:k2014.

146. Damschroder LJ, Aron DC, Keith RE, Kirsh SR, Alexander JA, Lowery JC. Fostering implementation of health services research findings into practice: a consolidated framework for advancing implementation science. Implementation Science. 2009;4(1):50.

147. Poksinska B. The current state of Lean implementation in health care: literature review. Qual Manag Health Care. 2010;19.

148. Andersen H, Rovik KA. Lost in translation: a case-study of the travel of lean thinking in a hospital. BMC Health Serv Res. 2015;15:401.

149. Harrison MI, Paez K, Carman K, Stephens J, Smeeding L, Devers K, et al. Effects of Organizational Context on Lean Project Implementation in Five Hospital Systems. Health Care Manage Rev. 2016;Apr-Jun; 41(2):127-44.

150. Hussein BA. Factors influencing project success criteria. 2013 IEEE 7th International Conference on Intelligent Data Acquisition and Advanced Computing Systems (IDAACS); 12-14 Sept. 2013; Berlin, Germany 2013. p. 566-71.

151. Department of Health and Human Services. Specialist clinics improvement guide [Internet]. State Government of Victoria; 2013 [cited 2017 Oct 31]. Available from: https://www2.health.vic.gov.au/hospitals-and-health-services/patient-care/specialist-clinics/access-policy

152. Morrow E, Robert G, Maben J, Griffiths P. Implementing large-scale quality improvement: lessons from The Productive Ward: Releasing Time to Care. Int J Health Care Qual Assur. 2012;25(4):237-53.

153. van Leijen-Zeelenberg JE, van Raak AJA, Duimel-Peeters IGP, Kroese MEAL, Brink PRG, Ruwaard D, et al. Barriers to implementation of a redesign of information transfer and feedback in acute care: results from a multiple case study. BMC Health Serv Res. 2014;14(1):149.

154. Bohmer RM. The hard work of health care transformation. NEJM. 2016;375(8):709-11.

155. Robbins J, Garman AN, Song PH, McAlearney AS. How high-performance work systems drive health care value: an examination of leading process improvement strategies. Qual Manag Health Care. 2012;21(3):188-202.

156. Ong MS, Coiera E. A systematic review of failures in handoff communication during intrahospital transfers. Jt Comm J Qual Patient Saf 2011;37(6):274-84.

157. Brandao De Souza L. Trends and approaches in lean healthcare. Leadersh Health Serv. 2009;22(2):122-39.

158. D'Andreamatteo A, Ianni L, Lega F, Sargiacomo M. Lean in healthcare: A comprehensive review. Health Policy. 2015;119(9):1197-209.

159. Waldhausen JH, Avansino JR, Libby A, Sawin RS. Application of lean methods improves surgical clinic experience. J Ped Surg. 2010;45(7):1420-5.

160. Skeldon SC, Simmons A, Hersey K, Finelli A, Jewett MA, Zlotta AR, et al. Lean methodology improves efficiency in outpatient academic uro-oncology clinics. Urology. 2014;83(5):992-7.

161. Rauh S, Arnold D, Braga S, Curca R, Eckert R, Frobe A, et al. Challenge of implementing clinical practice guidelines. Getting ESMO's guidelines even closer to the bedside: introducing the ESMO Practising Oncologists' checklists and knowledge and practice questions. ESMO open. 2018;3(5):e000385.

162. Waring J, Marshall F, Bishop S, Sahota O, Walker M, Currie G, et al. An ethnographic study of knowledge sharing across the boundaries between care processes, services and organisations: the contributions to 'safe' hospital discharge. Health Services and Delivery Research. 2014(No. 2.29).

163. Dos Reis Leite HV, Bateman N, Radnor ZJ, editors. A classification model of the lean barriers and enablers: a case from Brazilian healthcare. 23rd EurOMA Conference, Trondheim, Norway, 17th-22nd June; 2016.

164. Ulhassan W, Sandahl C, Westerlund H, Henriksson P, Bennermo M, von Thiele Schwarz U, et al. Antecedents and characteristics of lean thinking implementation in a Swedish hospital: a case study. Qual Manag Health Care. 2013;22(1):48-61.

165. Vos L, Dückers MLA, Wagner C, van Merode GG. Applying the quality improvement collaborative method to process redesign: a multiple case study. Implementation Science. 2010;5:19.

166. Graber DR, Kilpatrick AO. Establishing values-based leadership and value systems in healthcare organizations. J Health Hum Serv Adm. 2008;31(2):179-97.

167. Belassi W, Tukel O. A New framework for determining critical success/failure factors in projects. Int J Proj Manag. 1996;14(3):141-51.

168. Li J, Talari P, Kelly A, Latham B, Dotson S, Manning K, et al. Interprofessional Teamwork Innovation Model (ITIM) to promote communication and patient-centred, coordinated care. BMJ Qual Saf. 2018;Sep;27(9):700-9.

169. Kuziemsky C. Decision-making in healthcare as a complex adaptive system. Healthc Manage Forum. 2016;29(1):4-7.

170. Borycki E, Dexheimer JW, Hullin Lucay Cossio C, Gong Y, Jensen S, Kaipio J, et al. Methods for Addressing Technology-induced Errors: The Current State. Yearb Med Inform. 2016(1):30-40.

171. Greenhalgh T, Papoutsi C. Studying complexity in health services research: desperately seeking an overdue paradigm shift. BMC Med. 2018;16(1):95.

172. Cohn S, Clinch M, Bunn C, Stronge P. Entangled complexity: Why complex interventions are just not complicated enough. J Health Serv Res Policy. 2013;18(1):40-3.

173. Braithwaite J, Churruca K, Ellis LA. Can we fix the uber-complexities of healthcare? J R Soc Med. 2017;110(10):392-4.

174. Moore GF, Audrey S, Barker M, Bond L, Bonell C, Hardeman W, et al. Process evaluation of complex interventions: Medical Research Council guidance. BMJ 2015;350:h1258.

175. Wolpert M, Rutter H. Using flawed, uncertain, proximate and sparse (FUPS) data in the context of complexity: learning from the case of child mental health. BMC Medicine. 2018;16(1):82.

176. Mannion R, Braithwaite J. False Dawns and New Horizons in Patient Safety Research and Practice. Int J of Health Policy Manag. 2017;6(12):685-9.

177. Penfold RB, Zhang F. Use of interrupted time series analysis in evaluating health care quality improvements. Acad Pediatr. 2013;13(6 Suppl):S38-44.

178. Bouckaert N, Van den Heede K, Van de Voorde C. Improving the forecasting of hospital services: A comparison between projections and actual utilization of hospital services. Health Policy. 2018;122(7):728-36.

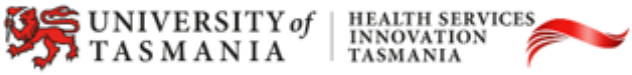
179. Daley J, Duckett S, Goss P, Terrill M, Wood D, Wood T. State Orange Book 2018: Grattan Institute; 2018.

180. Grattan Institute. About us [Internet]. 2018 [cited 2018 Nov 12]. Available from: https://grattan.edu.au/about-us/.

181. Baxter G, Sommerville I. Socio-technical systems: From design methods to systems engineering. Interacting with Computers. 2011;23(1):4-17.

Appendices

Appendix (i) Patient experience survey



Patient Experience Survey (Outpatients)

1. **What is the name of the Outpatient Clinic you attended today?**

.....

2. **Have you ever visited this Outpatient Clinic before?**

☐ Yes……go to Question 3
☐ No…… go to Question 4

3. **If Yes, was it for the same condition?**

☐ Yes
☐ No

4. **From the time you were first told you needed an appointment to this clinic, how long did you wait for your first visit?**

☐ Less than 1 month
☐ 1 month to 6 weeks
☐ More than 6 weeks but no more than 3 months
☐ More than 3 months but no more than 5 months
☐ More than 5 months but no more than 12 months
☐ More than 12 months but no more than 18months
☐ More than 18 months
☐ I went to Outpatients without an appointment
☐ Don't know / Can't remember

5. **Do you think the amount of time you waited to get an appointment was…?**

☐ About right
☐ Slightly too long
☐ Much too long

6. **Did your symptoms or condition get worse while you were waiting for your appointment?**

☐ Yes, definitely
☐ Yes, to some extent
☐ No
☐ Don't know / Can't remember

Still thinking about today's appointment:

7. **Were you given an appointment time or were you able to choose one yourself?**

☐ I was given an appointment time and I accepted it
☐ I was given an appointment time and I changed it
☐ I chose the appointment time myself
☐ Don't know/can't remember

8. **Were you able to get an appointment time that suited you?**

☐ Yes
☐ No
☐ I didn't have an appointment

9. **How long did it take you to travel to the clinic for this appointment?**

- ☐ Under 30 minutes
- ☐ 30 to 59 minutes
- ☐ Between 1 and 2 hours
- ☐ Between 2 and 3 hours
- ☐ 3 hours or more
- ☐ Don't know/can't remember

10. **What was your main form of transport to the clinic? Please tick ONE answer only**

- ☐ By private car – you were the driver
- ☐ By private car – a friend or relative was the driver
- ☐ By a hospital or community transport service
- ☐ By taxi
- ☐ By public transport
- ☐ On foot
- ☐ Other please state:

Waiting in the clinic:

11. **How many staff members did you have contact with during today's clinic appointment?**

- ☐ 2-3
- ☐ 4-5
- ☐ 6 or more

12. **Did you have enough time to discuss your health issue with the health professional(s) you saw?**

- ☐ Yes, definitely
- ☐ Yes, to some extent
- ☐ No

13. **Did the health professional(s) in the clinic today explain things in a way you could understand?**

- ☐ Yes, always
- ☐ Yes, sometimes
- ☐ No

14. **During this visit, did the health professional(s) know enough about your medical history?**

- ☐ Yes, definitely
- ☐ Yes, to some extent
- ☐ No

15. **Were you involved, as much as you wanted to be, in decisions about your care and treatment?**

- ☐ Yes, definitely
- ☐ Yes, to some extent
- ☐ No
- ☐ I did not want or need to be involved

16. How would you rate how well the health professionals worked together?

- ☐ Not applicable – only saw one
- ☐ Very good
- ☐ Good
- ☐ Neither good nor poor
- ☐ Poor
- ☐ Very poor

17. Before you arrived for your appointment today, did you know the reason for today's appointment?

- ☐ Yes, definitely
- ☐ Yes, to some extent
- ☐ No

18. When you left the clinic, were you given enough information about how to manage your care at home?

- ☐ Yes, completely
- ☐ Yes, to some extent
- ☐ No, I was not given enough information
- ☐ No, I did not need this type of information

19. Did the health professional(s) at this clinic provide you with a treatment plan for your ongoing care?

- ☐ Yes, I was given a written plan
- ☐ Yes, I was given a plan verbally
- ☐ No, but I would have liked one
- ☐ No, I did not need one

20. How would you rate the overall care you received in the clinic today?

- ☐ Very good
- ☐ Good
- ☐ Neither good nor poor
- ☐ Poor
- ☐ Very poor

Your background:

21. What is the highest level of education you (the patient) have completed?

- ☐ Still at school/college
- ☐ Less than year 10
- ☐ Completed year 10
- ☐ Completed year 12
- ☐ Trade or technical certificate or diploma
- ☐ University degree

Appendix (ii) Patient experience consent form

Australian Government
Health Services Innovation Tasmania is funded by the Australian Government through the Tasmanian Health Assistance Package

Health Services Innovation Tasmania

UNIVERSITY of TASMANIA

Outpatient Clinic Experience

Consent Form

---

1. I acknowledge that the nature, purpose and contemplated effects of the project so far as it affects me, have been fully explained to my satisfaction by the research worker and that my consent is given voluntarily.

2. The details of the study have also been explained to me, including the anticipated length of time it will take. I understand that my involvement means:

    - Undertaking a survey that will evaluate my experience with my outpatient clinic appointment, which will take approximately 5 minutes.
    - Collection of my age, gender and postcode (but not my name).
    - Providing consent for the researchers to access hospital data detailing the amount of time I spent in the Outpatient Clinic on this occasion.

3. I understand that there are the following risks or possible discomfort:

    - There are no risks associated with participation. There will be a slight inconvenience due to the time to undertake the survey. I am able to withdraw from the trial at any point in time without any effect on my medical care.

4. Although I understand that the purpose of this research project is to improve the quality of medical care, it has also been explained that my involvement may not be of any direct benefit to me.

5. I have been given the opportunity to have a member of my family or friend present while the project was explained to me.

6. I am informed that no information regarding any medical history will be divulged and the results of any tests involving me will not be published so as to reveal my identity.

7. I understand that my involvement in the project will not affect my relationship with my medical advisers in their management of my health. I also understand that I am free to leave the project at any stage and withdraw any data/medical information that has been collected. My withdrawal will not affect my legal rights, my medical care or my relationship with the hospital or my doctors.

8. I understand that I will be given a signed copy of this patient information sheet and consent form. I am not giving up my legal rights by signing this consent form.

9. I understand that the trial will be conducted in accordance with the latest versions of the *National Statement on Ethical Conduct in Human Research 2007* and applicable privacy laws.

Name of participant

Signature of participant_____
Date_____

10. I have explained this project and the implications of participation in it to this volunteer and I believe that the consent is informed and that he/she understands the implications of participation.

Name of investigator
_____

Signature of investigator_____
Date_____

Appendix (iii) Patient experience information sheet

An Invitation to Share Your Outpatient Clinic Experience

- We invite you to help us improve our outpatient department services by telling us about the care you received during today's outpatient visit.
- You will be asked to complete a brief survey which will take about 5 minutes to complete.
- Please fill out the survey after attending the outpatient clinic and place in the box provided or return by post in the pre-paid envelope.
- Your care provided by the hospital staff or General Practitioner will not be affected by whether or not you choose to do the survey.
- Participation in this project may not directly benefit you, but it may be helpful in the management of patients who attend the outpatient clinics in the future.
- Everything we ask you will be kept *strictly confidential*. Your hospital record number will be used temporarily to record details such as your age, gender, name of clinic attended and postcode (but not your name). Your hospital record number will also be used to measure how much time you have spent on the waiting list, how many visits you have attended overall and if the hospital has cancelled any appointments in the past.
- Afterwards, your identity will be removed from all information collected, and the data will be anonymous.
- Data will be stored in a locked cabinet at the University of Tasmania for a period of 5 years, and then destroyed. Only the researchers directly involved with collection of your information will have access to information that identifies you.
- Any information that is published will be summarised and included with all other participants' information. No individual patient details will be published. You are able to withdraw your consent at any point during the study. Further information can be obtained from Erin Gee from the University of Tasmania (phone (03) 6226 6982.
- The project has received ethical approval from the Human Research Ethics Committee (Tasmania) Network. If you have any concerns of an ethical nature or complaints about the manner in which the project is conducted you can contact the Executive Officer of the Human Research Ethics Committee (Tasmania) Network on (03) 6226 7479 or human.ethics@utas.edu.au.

Thank you for your participation.

Professor Gregory Peterson
Chief Investigator

UNIVERSITY of TASMANIA

Health Services Innovation Tasmania

Australian Government
Health Services Innovation Tasmania is funded by the Australian Government through the Tasmanian Health Assistance

Appendix (iv) Ethics approval letter (H0014757)

Office of Research Services
University of Tasmania
Private Bag 1
Hobart Tasmania 7001
Telephone + 61 3 6226 7479
Facsimile + 61 3 6226 7148
Email Human.Ethics@utas.edu.au
www.research.utas.edu.au/human_ethics/

HUMAN RESEARCH ETHICS COMMITTEE (TASMANIA) NETWORK

UTAS

15 April 2015

Professor Gregory Peterson
School of Medicine, Faculty of Health
University of Tasmania

Sent via email

Dear Professor Peterson

REF NO: H0014757
TITLE: Improving patient flow through specialist outpatient clinics

Document	*Version*	*Date*
HREC Low Risk Application form		
Patient Questionnaire (2)		
Staff satisfaction survey		
OP Initiative Information Sheet (patients)		
OP Initiative Information Sheet (staff)		
OP Initiative Consent form (patients)		
OP Initiative Consent form (staff)		
HREC Privacy Form		

The Tasmanian Health and Medical Human Research Ethics Committee considered and approved the above documentation on **23 March 2015** to be conducted at the following site(s):

Royal Hobart Hospital

Please ensure that all investigators involved with this project have cited the approved versions of the documents listed within this letter and use only these versions in conducting this research project.

This approval constitutes ethical clearance by the Health and Medical HREC. The decision and authority to commence the associated research may be dependent on factors beyond the remit of the ethics review process. For example, your research may need ethics clearance from other organisations or review by your research governance coordinator or Head of Department. It is your responsibility to find out if the approvals of other bodies or authorities are required. It is recommended that the proposed research should not commence until you have satisfied these requirements.

All committees operating under the Human Research Ethics Committee (Tasmania) Network are registered and required to comply with the *National Statement on the Ethical Conduct in Human Research* (NHMRC 2007 updated 2014).

Therefore, the Chief Investigator's responsibility is to ensure that:

(1) The individual researcher's protocol complies with the HREC approved protocol.

(2) Modifications to the protocol do not proceed until **approval** is obtained in writing from the HREC. Please note that all requests for changes to approved documents must include a version number and date when submitted for review by the HREC.

(3) Section 5.5.3 of the National Statement states:

Researchers have a significant responsibility in monitoring approved research as they are in the best position to observe any adverse events or unexpected outcomes. They should report such events or outcomes promptly to the relevant institution/s and ethical review body/ies and take prompt steps to deal with any unexpected risks.

The appropriate forms for reporting such events in relation to clinical and non-clinical trials and innovations can be located at the website below. All adverse events must be reported regardless of whether or not the event, in your opinion, is a direct effect of the therapeutic goods being tested. http://www.research.utas.edu.au/human_ethics/medical_forms.htm

(4) All research participants must be provided with the current Patient Information Sheet and Consent Form, unless otherwise approved by the Committee.

(5) The Committee is notified if any investigators are added to, or cease involvement with, the project.

(6) This study has approval for four years contingent upon annual review. A *Progress Report* is to be provided on the anniversary date of your approval. Your first report is due **23 March 2016.** You will be sent a courtesy reminder closer to this due date.

(7) A *Final Report* and a copy of the published material, either in full or abstract, must be provided at the end of the project.

Should you have any queries please do not hesitate to contact me on (03) 6226 2764.

Yours sincerely

Digitally signed by Lynda Hobman
DN: cn=Lynda Hobman, o, ou, email=lynda.hobman@utas.edu.au, c=AU
Date: 2015.04.15 15:25:18 +10'00'

Lynda Hobman
Administration Officer (Integrity and Ethics)
Research Integrity and Ethics Unit
Office of Research Services
University of Tasmania
03 6226 6254

Appendix (v) Staff satisfaction survey (original)

Outpatient Staff Satisfaction Survey (Original)

Survey number:

Email Address:

Please tick the clinic/s where you predominately work:

- ☐ Orthopaedics
- ☐ Plastics
- ☐ ENT
- ☐ Neurosurgery
- ☐ Ophthalmology

1. **About you:**
   a) **Gender**
      - ☐ Male
      - ☐ Female

   b) **Age**
      - ☐ 16-20
      - ☐ 21-30
      - ☐ 31-40
      - ☐ 41-50
      - ☐ 51-65
      - ☐ 66+

2. **How many years have you worked in the Outpatient Clinics at the Royal Hobart Hospital?**
      - ☐ Less than 1 year
      - ☐ 1-2 years
      - ☐ 3-5 years
      - ☐ 6-10 years
      - ☐ 11-15 years
      - ☐ More than 15 years

3. **What is your occupational group? Please select the category as per your current role.**
      - ☐ Nursing e.g. all nursing staff working in direct clinical capacity.
      - ☐ Medical e.g. physician, surgeon, GP liaison
      - ☐ Physiotherapist
      - ☐ Occupational Therapist
      - ☐ Pharmacist

- ☐ Dietitian
- ☐ Podiatrist
- ☐ Social Worker
- ☐ Speech Pathologist
- ☐ Social Worker
- ☐ Other Allied Health e.g. Orthotist, Audiologist,
- ☐ Allied Health Assistant
- ☐ Bio Technician e.g. Biomedical
- ☐ Operational Support e.g. cleaning, food services, ward clerk, clinic clerk, equipment scheme, safety and quality
- ☐ Corporate Services e.g. administrative manager / director, finance, executive support, media liaison, maintenance, purchasing, IT.

4. To what extent do you agree or disagree with the following statements about your primary area of work in the clinics?

a) There are frequent opportunities for me to show initiative in my role.

- ☐ Strongly agree
- ☐ Agree
- ☐ Neither agree nor disagree
- ☐ Disagree
- ☐ Strongly disagree

b) I am able to make suggestions to improve the work of my team / department.

- ☐ Strongly agree
- ☐ Agree
- ☐ Neither agree nor disagree
- ☐ Disagree
- ☐ Strongly disagree

c) I am involved in deciding on changes introduced that affect my work area / team / department.

- ☐ Strongly agree
- ☐ Agree
- ☐ Neither agree nor disagree
- ☐ Disagree
- ☐ Strongly disagree

d) I am able to make improvements happen in my area of work.

- ☐ Strongly agree
- ☐ Agree
- ☐ Neither agree nor disagree
- ☐ Disagree
- ☐ Strongly disagree

e) I am able to meet all the conflicting demands on my time at work.

- ☐ Strongly agree
- ☐ Agree
- ☐ Neither agree nor disagree
- ☐ Disagree
- ☐ Strongly disagree

f) I am able to do my job to a standard I am personally pleased with.

- ☐ Strongly agree
- ☐ Agree
- ☐ Neither agree nor disagree
- ☐ Disagree
- ☐ Strongly disagree

5. How satisfied are you with each of the following aspects of your job?:

a) The recognition I get for good work.

- ☐ Very satisfied
- ☐ Satisfied
- ☐ Neither satisfied nor dissatisfied
- ☐ Dissatisfied
- ☐ Very dissatisfied

b) The support I get from my work colleagues.

- ☐ Very satisfied
- ☐ Satisfied
- ☐ Neither satisfied nor dissatisfied
- ☐ Dissatisfied
- ☐ Very dissatisfied

c) The opportunities I have to use my skills.

- ☐ Very satisfied
- ☐ Satisfied
- ☐ Neither satisfied nor dissatisfied
- ☐ Dissatisfied
- ☐ Very dissatisfied

d) **The amount of time spent on administration**

- ☐ Very satisfied
- ☐ Satisfied
- ☐ Neither satisfied nor dissatisfied
- ☐ Dissatisfied
- ☐ Very dissatisfied

e) **The opportunity I have to further develop my skills in relation to improving systems and processes.**

- ☐ Very satisfied
- ☐ Satisfied
- ☐ Neither satisfied nor dissatisfied
- ☐ Dissatisfied
- ☐ Very dissatisfied

6. Generally, how do the following statements apply to you and your job

a) **I can make an effective contribution to the Multi-Disciplinary Team that cares for patients.**

- ☐ Strongly agree
- ☐ Agree
- ☐ Neither agree nor disagree
- ☐ Disagree
- ☐ Strongly disagree
- ☐ Not applicable to my role

b) **The care plan for the patient is clear and accessible to all clinical staff.**

- ☐ Strongly agree
- ☐ Agree
- ☐ Neither agree nor disagree
- ☐ Disagree
- ☐ Strongly disagree
- ☐ Not applicable to my role

c) **The discharge criteria back to community care is clear and accessible to all clinical staff.**

- ☐ Strongly agree
- ☐ Agree
- ☐ Neither agree nor disagree
- ☐ Disagree
- ☐ Strongly disagree
- ☐ Not applicable to my role

7. **To what extent do these statements reflect your view of your organisation (hospital) as a whole?**

   a) **The organisation prioritises patient care.**
   - ☐ Strongly agree
   - ☐ Agree
   - ☐ Neither agree nor disagree
   - ☐ Disagree
   - ☐ Strongly disagree

   b) **The organisation acts on concerns raised by patients / patient carers.**
   - ☐ Strongly agree
   - ☐ Agree
   - ☐ Neither agree nor disagree
   - ☐ Disagree
   - ☐ Strongly disagree

   c) **The organisation listens to staff.**
   - ☐ Strongly agree
   - ☐ Agree
   - ☐ Neither agree nor disagree
   - ☐ Disagree
   - ☐ Strongly disagree

   d) **I would recommend the organisation as a place to work.**
   - ☐ Strongly agree
   - ☐ Agree
   - ☐ Neither agree nor disagree
   - ☐ Disagree
   - ☐ Strongly disagree

   e) **If a friend or relative needed treatment I would be happy with the standard of care provided by the organisation.**
   - ☐ Strongly agree
   - ☐ Agree
   - ☐ Neither agree nor disagree
   - ☐ Disagree
   - ☐ Strongly disagree

8. **Overall, when thinking about your current level of satisfaction as a staff member of this hospital:**
(please circle a number)

I am very dissatisfied — I am very satisfied

0 1 2 3 4 5 6 7 8 9 10

9. **Are there any other factors not outlined above which impact your level of job satisfaction? Please specify:**

Thank you very much for your assistance.

Please check that all questions have been answered and place the form in the box provided.

Appendix (vi) Redesign workshop agenda

UNIVERSITY of TASMANIA | HEALTH SERVICES INNOVATION TASMANIA | RHH ROYAL HOBART HOSPITAL

OUTPATIENTS: Wellington Clinics

RAPID IMPROVEMENT EVENT

Baha'i Centre - 30 & 31st March 2015

Participating Units: Ophthalmology, Orthopaedic Surgery, ENT, Neurosurgery, Plastics

Proposed Agenda

Time	Day One
0815	Welcome & introductions; Coffee on arrival:
0830	Units report of current state: Present Power Point: All Five units
1000	Flow and Waste: overview to look out for in the Big Picture Map
1025	Morning Tea
1045	"Big Picture map" with each unit; Referral, triage, waitlist, book, apt, discharge, follow up
1230	Lunch
1300	Capacity and Demand
	Alternative pathways
1415	What do patients value? What should our core business be?
1530	Gastro case Study
1600	Reflections: Close

Day Two

0815	Reflections on day one
0830	Visual management & Standard work
0915	Standardise
	• Referral process
	• Triage process
	• Discharge/Transfer of care Process
	• Waitlist management.
	• Audit of wait lists
1030	Morning tea
1045	What can we do short/long term to be more customer focused?
1200	Lunch
1230	Develop action Plan, work on templates, guidelines
	Working group formation and times to meet
1330	Report back on each unit plans for the next 3 months
1600	Close

Enquires to dianne.mulcahy@dhhs.tas.gov.au

Appendix (vii) Ethics amendment (observations and field notes)

Subject: Notification of Amendment Approval: H0014757 Improving patient flow through specialist outpatient clinics

Dear Professor Peterson

Ethics Ref: H0014757
Title: Improving patient flow through specialist outpatient clinics

This email is to confirm that the following amendment was approved by the Chair of the Tasmania Health and Medical Human Research Ethics Committee on 23/2/2017:

Miscellaneous Ethical permission to include de-identified qualitative observations and field notes in the project's results
Amendment Investigator - ADON Research and Practice Development Dr Karen Ford

All committees operating under the Human Research Ethics Committee (Tasmania) Network are registered and required to comply with the National Statement on Ethical Conduct in Human Research (NHMRC 2007).

This email constitutes official approval. If your circumstances require a formal letter of amendment approval, please let us know.

Should you have any queries please do not hesitate to contact me.

Kind regards

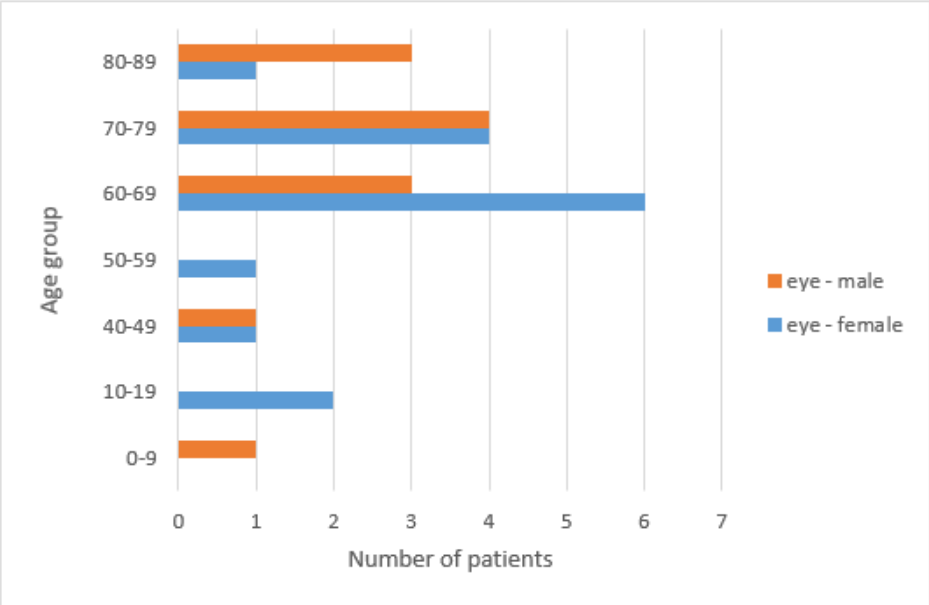
Heather Vail

Heather Vail
Executive Officer, Health and Medical Human Research Ethics Committee
Research Integrity and Ethics Unit
Office of Research Services
University of Tasmania
Private Bag 01

Appendix (viii) Ophthalmology patient pre-study survey results

Clinical Redesign Outpatients Clinic (30/05/15)

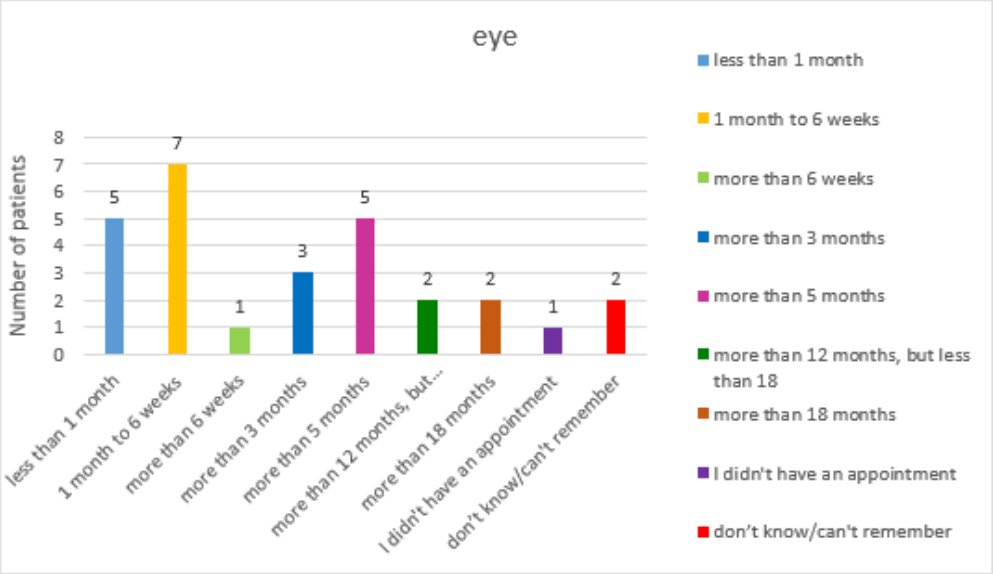
Demographics of patients surveyed (n=28, opportunistic sample of patients from Mondays and Thursdays ophthalmology clinics in March 2015)



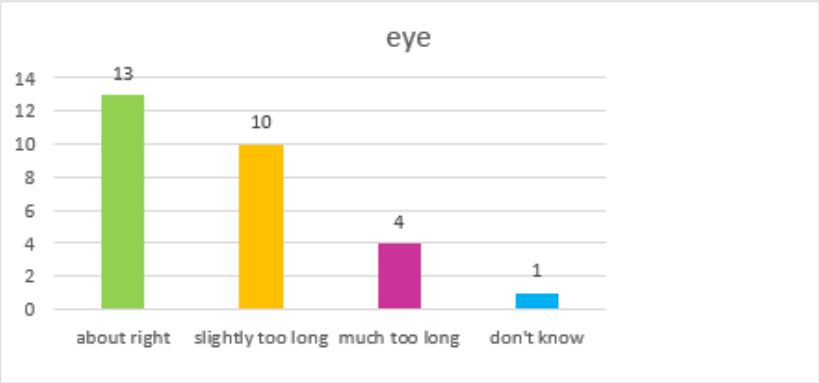
Q2. **Have you ever visited this Outpatient clinic before?**
Yes = 23
No = 5

Q3. **If yes, was it for the same condition?**
Yes = 23
No = Nil

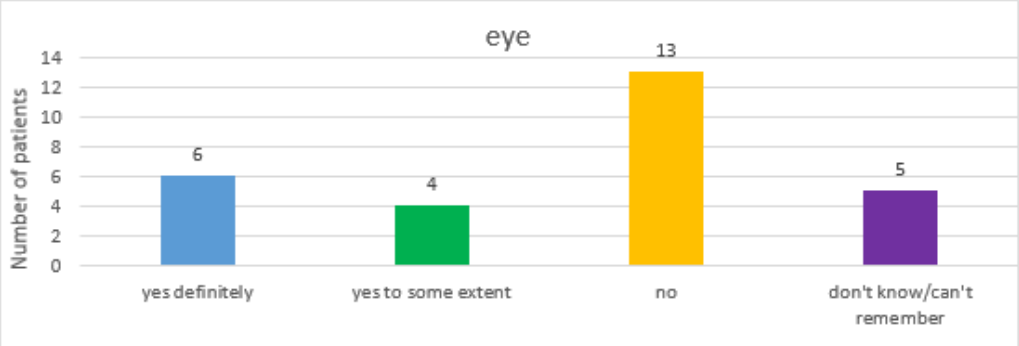
Q4. From the time you were first told you needed an appointment to this clinic, how long did you wait for your first visit?



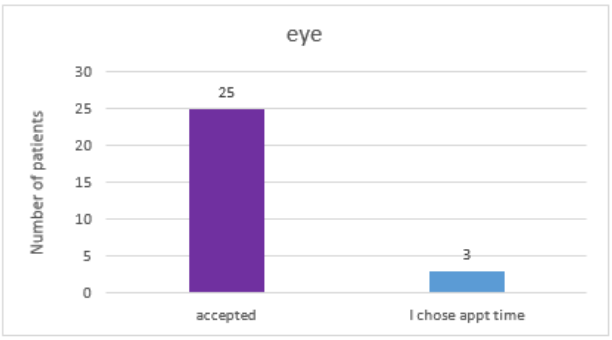
Q5. Do you think the amount of time you waited obtain an appointment was...?



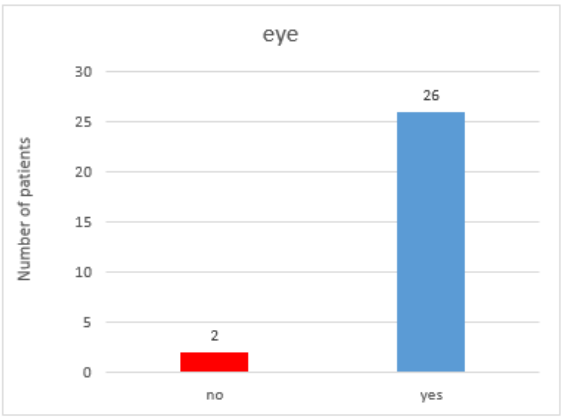
6. Did your symptoms or condition get worse while you were waiting for your appointment?



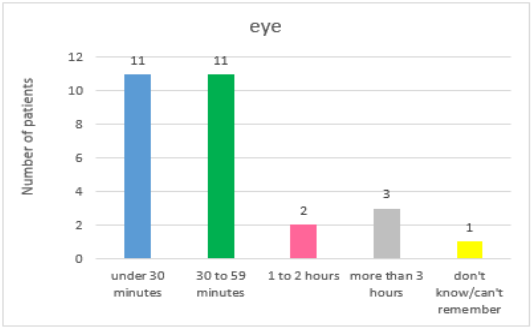
7. Were you given an appointment time or were you able to choose one yourself?



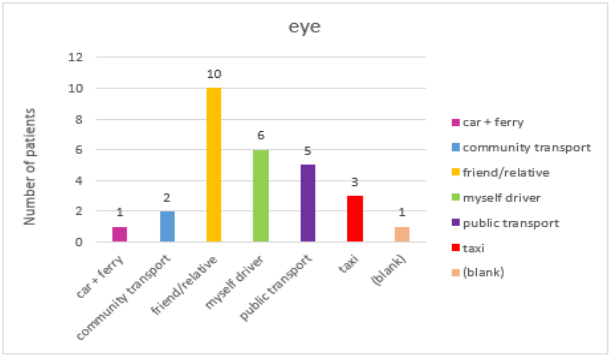
8. Were you able to get an appointment time that suited you?



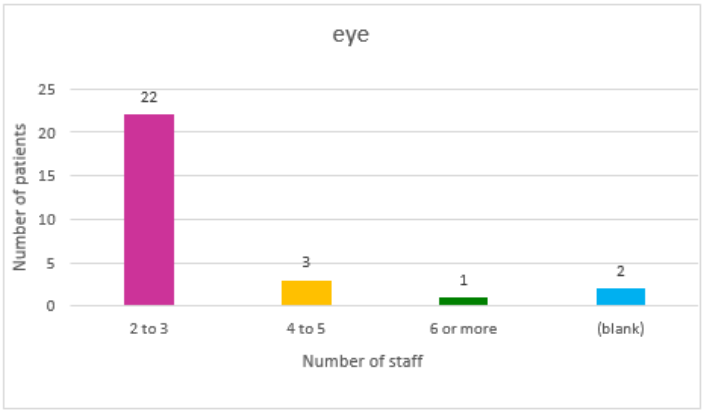
Q9. How long did it take to travel to the clinic for this appointment?



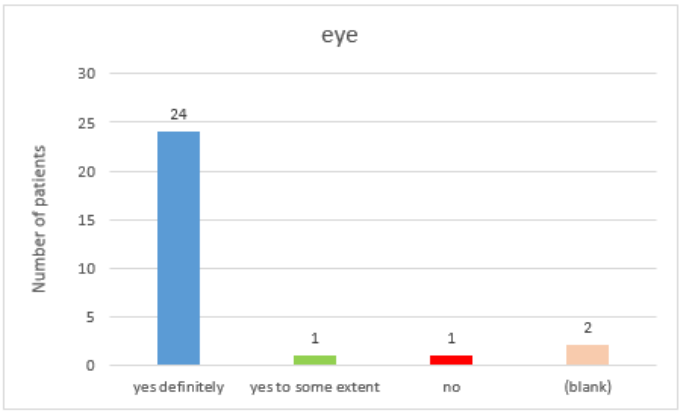
Q10. What was your main form of transport to the clinic? Please tick One only



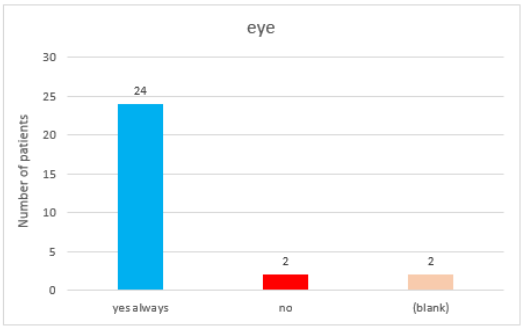
Q11. How many staff did you come into contact with today at clinic?



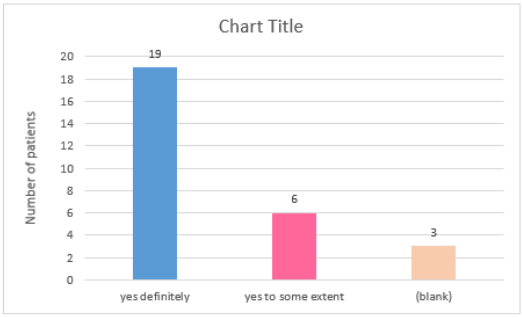
Q12. Did you have enough time to discuss your health issue with the health professional(s) you saw?



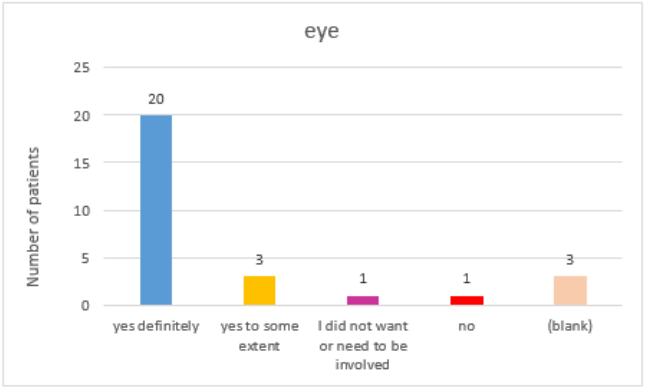
Q13. Did the health professional(s) in the clinic today explain things in a way you could understand?



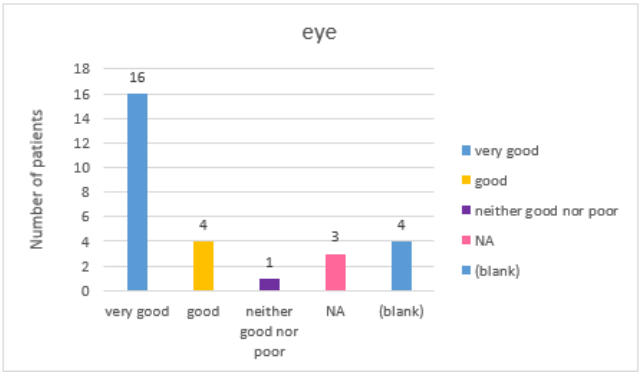
Q14. During this visit, did the health professional(s) know enough about your medical history?



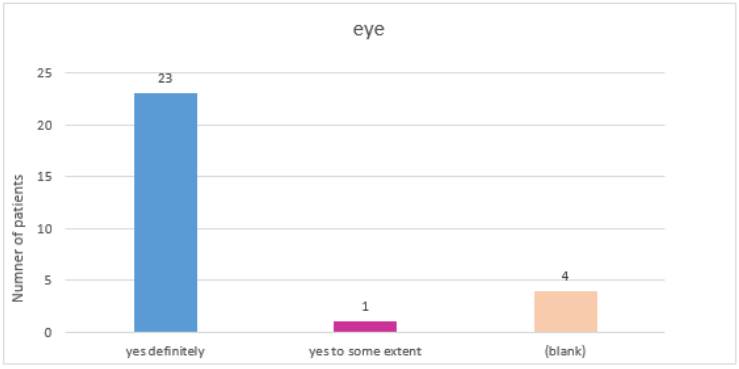
Q15. Were you involved, as much as you wanted to be, in decisions about your care and treatment?



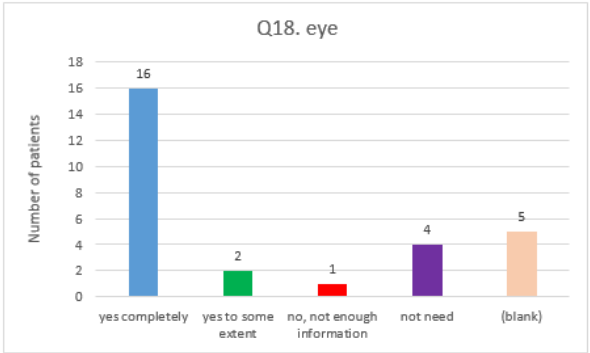
Q16. How would you rate how well the health professionals worked together?



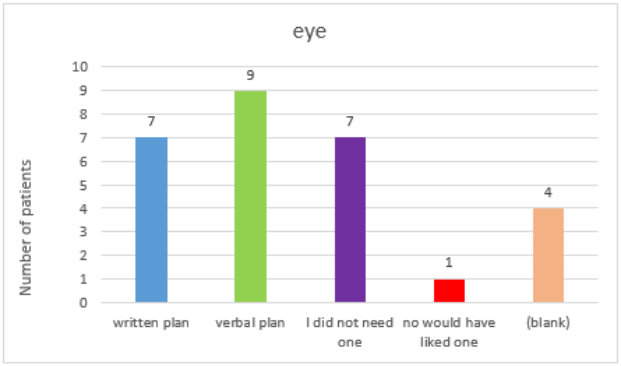
Q17. Before you arrived for your appointment today, did you know the reason for today's appointment?



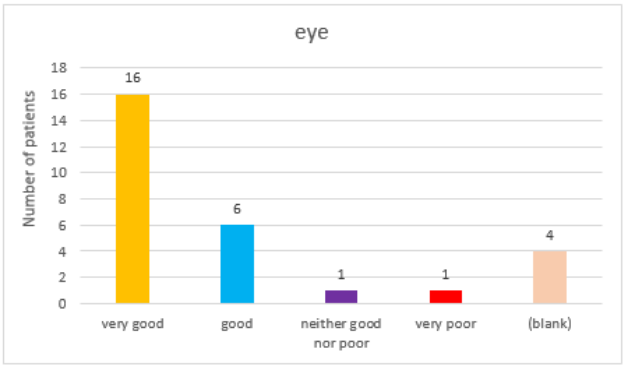
Q18. When you left the clinic, were you given enough information about how to manage your care at home?



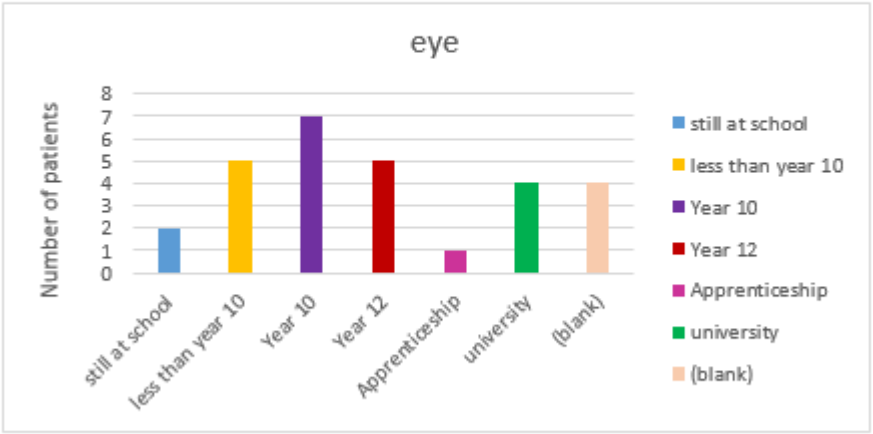
Q19. **Did the health professional(s) at this clinic provide you with a treatment plan for your ongoing care?**



Q20. **Overall, how would you rate the care you received in the clinic?**



Q21. **What is the highest level of education you (the patient) have completed?**



Appendix (ix) Ethics amendment (updated staff survey)

Subject: Notification of Amendment Approval: H0014757 Improving patient flow through specialist outpatient cl

Dear Professor Peterson

Ethics Ref: H0014757
Title: Improving patient flow through specialist outpatient clinics

This email is to confirm that the following amendment was approved by the Chair of the Tasmania Health and Medical Human Research Ethics Committee on 28/4/2016:

Amendment Onformation Sheet (patients) version 2 Amendment NEW STAFF OP Initiative Information Sheet Amendment plasticssurveystaff

All committees operating under the Human Research Ethics Committee (Tasmania) Network are registered and required to comply with the National Statement on Ethical Conduct in Human Research (NHMRC 2007).

This email constitutes official approval. If your circumstances require a formal letter of amendment approval, please let us know.

Should you have any queries please do not hesitate to contact me.

Kind regards

Lauren Black

--
Lauren Black
Executive Officer - Ethics
Office of Research Services
University of Tasmania
Private Bag 01
Hobart TAS 7001
Phone: (03) 6226 2764
Fax: (03) 6226 2765
Email: Lauren.Black@utas.edu.au
Web: http://www.research.utas.edu.au/

Appendix (x) Plastic surgery staff survey information sheet

Hospital Staff Clinical Redesign Experience in Plastics Outpatient Clinic Survey

INFORMATION SHEET

We would like to invite you to participate in this study, which involves completing one short survey on the clinical redesign activities that have taken place in the Plastics Outpatient Clinic. The aim of this study is to evaluate the perception of the progress of the redesign initiatives.

The survey will ask a series of questions in relation to designated initiatives as part of redesign activities, and will take approximately 5 minutes to complete. Participants who complete the surveys will be given a small token of appreciation (a bag of chocolates). All the data is anonymous. Ballot boxes will be placed in clinic to ease the return of completed surveys. Participation in this project will not affect your relationship with your employer. While participation in this project may not directly benefit you, it may be helpful to Outpatient Clinic staff in the future.

This information will be kept *strictly confidential*. Data will be stored in a locked cabinet at the University of Tasmania for a period of 5 years, after which it will be destroyed. If you do not participate, or if you choose to withdraw from this study at any point, it will not affect the relationship you have with your employer. You are able to withdraw your consent at any point during the study. Further information can be obtained from Erin Gee from the University of Tasmania (phone (03) 6226 6982.

The project has received ethical approval from the Human Research Ethics Committee (Tasmania) Network which is constituted under the National Health & Medical Research Council. The Committees under the HREC (Tasmania) Network use the National Statement on Ethical Conduct in Research Involving Humans Guidelines to inform their decisions. If you have any concerns of an ethical nature or complaints about the manner in which the project is conducted you can contact the Executive Officer of the Human Research Ethics Committee (Tasmania) Network on (03) 6226 7479 or human.ethics@utas.edu.au.

Thank you for your participation,

Professor Gregory Peterson
Chief Investigator

Appendix (xi) Plastic surgery staff survey

Dear Participants,

The Clinical Redesign Team are interested in your perceptions of the progress of the following Plastics Clinic Initiatives. For those who may be not familiar with the initiatives, here is an overview:

Physio first

Patients with the following conditions will benefit from seeing a physiotherapist while they are on the waiting list for an appointment with a surgeon:

- Trigger finger
- OA CMC joint of thumb
- Carpal tunnel syndrome

Changes to clinic flow

Nurses are assigned to consultation rooms and one of the consultants are not allocated patients but "helicopter" during clinic. The lead nurse is responsible for the DNA paperwork.

Nurse led clinic

The Nurse led clinic operates on a Tuesday morning and has 10 appointments available. There are guidelines surrounding the types of patients and referral procedure.

DNA policy

A "Failure to Attend for Booked Appointment" policy has been written for all THO South Outpatient Clinics. Guidelines are documented regarding rights and responsibilities of the staff and patients.

1) What is your occupational group? Please select the category as per your current role.

☐ Nursing
☐ Intern or RMO
☐ Registrar
☐ Consultant
☐ Physiotherapist
☐ Customer Service Operator
☐ Support Services *e.g. Aide*
☐ Other (please specify):_____

2) How long have you worked at the Royal Hobart Hospital?

☐ Less than a year
☐ 1 - 2 years
☐ 2 - 5 years
☐ 5 - 10 years
☐ 10 -15 years
☐ > 15 years

3) What has been your involvement with the Clinical Redesign Program to date? (tick all that apply)

☐ Working Group member (please specify clinic):_____
☐ I have participated in the implementation of initiatives in the clinics
☐ I have attended workshops run by HSI Tasmania
☐ I have attended education sessions about the initiatives
☐ I have had no involvement, but work in a clinic where change has occurred
☐ I have had no involvement
☐ I had the opportunity to be involved and chose not to
☐ Other (please specify):_____

4) What changes, if any, have you noticed in communication since the implementation of the initiatives with:

	largely positive	positive	negative	largely negative	no change
Staff within your professional discipline	☐	☐	☐	☐	☐
Staff outside your professional discipline	☐	☐	☐	☐	☐
Staff in the Multi-Disciplinary Team	☐	☐	☐	☐	☐
Staff in other clinics/areas	☐	☐	☐	☐	☐
Patients	☐	☐	☐	☐	☐

Any Comments? _____

5) To what extent do you agree with the following statements regarding the new Physio first model?

	strongly agree	agree	disagree	strongly disagree	unsure
I am aware of the Physio first model of care					
The guidelines are clear regarding the type patient suitable for this treatment pathway					
The referral process is easily understood by me					
Early intervention by a physiotherapist is beneficial for patients these conditions					
This initiative places extra stress on the physiotherapy clinic staff					

6) To what extent do you agree with the following statements regarding the new Changes to clinic flow?

	strongly agree	agree	disagree	strongly disagree	unsure
There is less time wasted waiting for advice from senior clinical staff					
Patients are more likely to be seen on time					
Clinics are more likely to start and finish on time					
There is more opportunity for teaching during clinic					
Patients spend less time alone in the consultation room					

7) To what extent do you agree with the following statements regarding the new Nurse-led clinic?

	strongly agree	agree	disagree	strongly disagree	unsure
I am aware of the nurse-led clinic					
The guidelines are clear regarding the type of patient suitable for this treatment pathway					
The nurse led clinic is currently underutilised					
The discharge guidelines regarding the Nurse-led clinic are clear					
The patients who are seen at this clinic are clinically appropriate					

8) To what extent do you agree with the following statements regarding the new DNA policy?

	strongly agree	agree	disagree	strongly disagree	unsure
I am aware of the new DNA policy					
I have read the new DNA policy					
I have referred to the new DNA policy for information regarding a patient					
The new DNA policy was well implemented					
This policy increases general patient access to clinics					

9) Reflecting on the Physio First Model:

a) What has been positive?

b) What has not worked so well?

c) What improvements do you think could be made?

10) Reflecting on the Changes to clinic flow:

a) What has been positive?

b) What has not worked so well?

c) What improvements do you think could be made?

11) Reflecting on Nurse led clinic:

a) What has been positive?

b) What has not worked so well?

c) What improvements do you think could be made?

12) Reflecting on the new DNA policy:

a) What has been positive?

b) What has not worked so well?

c) What improvements do you think could be made?

Appendix (xii) Ophthalmology staff survey information sheet

Hospital Staff Clinical Redesign Survey
Ophthalmology Outpatient Clinic

INFORMATION SHEET

We would like to invite you to participate in this study, which involves completing one short survey on the clinical redesign activities that have taken place in the Ophthalmology Outpatient Clinic. The aim of this study is to evaluate your perception of the progress of the redesign initiatives.

The survey will ask a series of questions in relation to designated clinical redesign activities, and will take approximately 5 minutes to complete. Participants who complete the surveys will be given a small token of appreciation (a bag of chocolates). All the data is anonymous. Ballot boxes will be placed in clinic to ease the return of completed surveys. Participation in this project will not affect your relationship with your employer. While participation in this project may not directly benefit you, it may be helpful to Outpatient Clinic staff in the future.

This information will be kept *strictly confidential*. Data will be stored in a locked cabinet at the University of Tasmania for a period of 5 years, after which it will be destroyed. If you do not participate, or if you choose to withdraw from this study at any point, it will not affect the relationship you have with your employer. You are able to withdraw your consent at any point during the study. Further information can be obtained from Erin Gee at the University of Tasmania (phone (03) 6226 6982).

The project has received ethical approval from the Human Research Ethics Committee (HREC) Tasmania Network which is constituted under the National Health & Medical Research Council. The Committees under the HREC Tasmania Network use the National Statement on Ethical Conduct in Research Involving Humans Guidelines to inform their decisions. If you have any concerns of an ethical nature or complaints about the manner in which the project is conducted you can contact the Executive Officer of the HREC Tasmania Network on (03) 6226 7479 or human.ethics@utas.edu.au.

Thank you for your participation,

Appendix (xiii) Ophthalmology staff survey

Ophthalmology Staff Clinical Redesign Survey

Dear Participants,

The Clinical Redesign Team are interested in your perceptions of the progress of the following Ophthalmology Clinic Initiatives. For those who may be not familiar with the initiatives, here is an overview:

Changes to clinic flow

- Placing the 'Orange card' in the patient notes to fast-track patients who have completed all investigations.
- Ward patients have appointments at designated times during the day.
- All the sessions and template codes were revised.
- Streamlining the post cataract follow-up appointments
- Using "3 coloured folders" for referral management
- All paediatric referrals and planned appointments are booked.

DNA policy

A "Failure to Attend for Booked Appointment" policy has been written for all THO South Outpatient Clinics. Guidelines are documented regarding rights and responsibilities of the staff and patients.

1) What is your occupational group? Please select the category as per your current role.

☐ Nursing
☐ Registrar
☐ Consultant
☐ Orthoptist
☐ Optometrist
☐ Technician
☐ Customer Service Officer
☐ Other (please specify): _____

2) What has been your involvement with the Clinical Redesign program to date? (tick all that apply)

☐ Working Group member
☐ I have participated in the implementation of initiatives in the clinics
☐ I have attended workshops run by HSI Tasmania
☐ I have attended education sessions about the initiatives
☐ I have had no involvement, but work in a clinic where change has occurred
☐ I have had no involvement
☐ I had the opportunity to be involved and chose not to

☐ Other please specify

---

3)	What changes, if any, have you noticed in communication since the implementation of the initiatives with:	very positive	positive	negative	very negative	no change
a)	Staff within your professional discipline	☐	☐	☐	☐	☐
b)	Staff in the Multi-Disciplinary Team	☐	☐	☐	☐	☐
c)	Staff in the Emergency Department	☐	☐	☐	☐	☐
d)	Staff at private eye clinics/theatres	☐	☐	☐	☐	☐
e)	Staff in the RHH theatres	☐	☐	☐	☐	☐
f)	Patients	☐	☐	☐	☐	☐

4)	To what extent do you agree with the following statements regarding the Changes to clinic flow?	strongly agree	agree	disagree	strongly disagree	unsure
a)	There are less unexpected "walk-ins"	☐	☐	☐	☐	☐
b)	Clinics are more likely to start and finish on time	☐	☐	☐	☐	☐
c)	There are less interruptions to clinic sessions	☐	☐	☐	☐	☐
d)	Patients spend less time in the waiting room after their investigations have completed	☐	☐	☐	☐	☐
e)	Booking appointments for all paediatric patients improves patient safety	☐	☐	☐	☐	☐

5) Reflecting on the Changes to clinic flow?

a) What has worked well?

_____

_____

_____

b) What has not worked so well?

_____

_____

_____

5) (continued) Reflecting on the Changes to clinic flow?

c) What improvements do you think could be made?

_____

_____

_____

6)	To what at extent do you agree with the following statements regarding the new DNA policy (for adult patients)?	strongly agree	agree	disagree	strongly disagree	unsure
a)	I am aware of the new DNA policy	☐	☐	☐	☐	☐
b)	I have read the new DNA policy	☐	☐	☐	☐	☐
c)	I have referred to the new DNA policy for information regarding a patient	☐	☐	☐	☐	☐
d)	The new DNA policy was well implemented	☐	☐	☐	☐	☐
e)	This policy increases general patient access to clinics	☐	☐	☐	☐	☐

For Customer Service Officers ONLY (other staff go to Q. 9)

7)	To what at extent do you agree with the following statements since the initiation of the redesign activities	strongly agree	agree	disagree	strongly disagree	unsure
a)	Booking appointments take less time	☐	☐	☐	☐	☐
b)	There are less phone calls regarding appointments for post-op patients	☐	☐	☐	☐	☐
c)	Clinics are less likely to be overbooked	☐	☐	☐	☐	☐
d)	More patients return to reception after their appointment	☐	☐	☐	☐	☐
e)	The rules concerning booking patient appointments are clear	☐	☐	☐	☐	☐
f)	Using the "3 coloured folders" improves the triage management process	☐	☐	☐	☐	☐

For Customer Service Officers ONLY

8) Reflecting on any of the clinical redesign iniatives

a. What has worked well?

_____

_____

_____

b. What has not worked so well?

_____

_____

_____

c. What improvements do you think could be made?

_____

_____

_____

All staff

9) Please provide any further comments you wish to add about the initiatives above, or suggestions for future clinical redesign initiatives in these areas:

Thank you very much for your assistance. Please ensure all questions are answered and place the completed survey in the box provided in Ophthalmology clinic.

Appendix (xiv) Appointment data extraction fields

Appointment data headings downloaded from iPM as an Excel extract

Number

Session

Session description

Unique Patient Identifier

Clinic

Patient date of birth

Patient date of death

Country

Appointment type

Movement reason

Date rescheduled

Cancellation date

Cancelled by

Cancelled reason

Session start date

Session start time

Planned

Clinic location

Clinician

Referral source

Interpreters

Attend status

Spoken language

Patient interpreter dialect

Interpreter booked

Interpreter gender

Appointment category

Scheduled outcome

Last modified by

Language group

Postcode

X

Session start year

Session start month

Session start day

Cancellation by

Change date

Notice of cancellation

Short notice

Short notice 3

Short notice 3-6

Appendix (xv) Waitlist data extraction fields

Waitlist data headings downloaded from iPM as an Excel extract

Patient identifier

Patient age

Patient suburb

Patient GP suburb

Patient GP postcode

Clinic code

Clinic name

Speciality

List name

Date on list

Time waiting days

Priority

Clinician

Admin category

Referral source

Removed status

Removal date

Removal reason

Removal month

Removal week

Removal year

Month added

Week added

Year added

Days waiting

Wait category time

Over-boundary?

Clinic group